THRILLING WONDER STORIES

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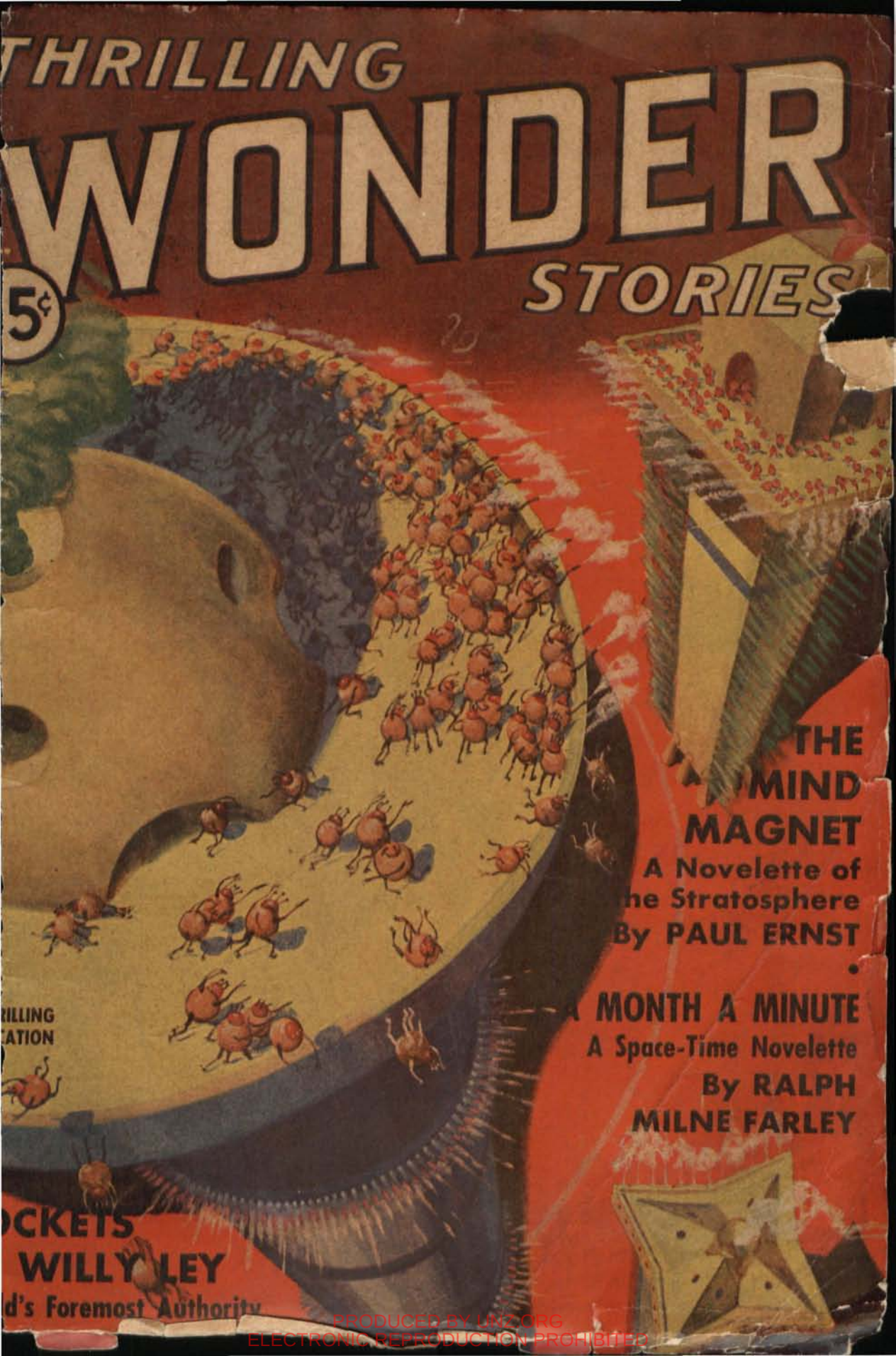

THE MIND MAGNET
A Novelette of the Stratosphere
By PAUL ERNST

A MONTH A MINUTE
A Space-Time Novelette
By RALPH MILNE FARLEY

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OCKETS
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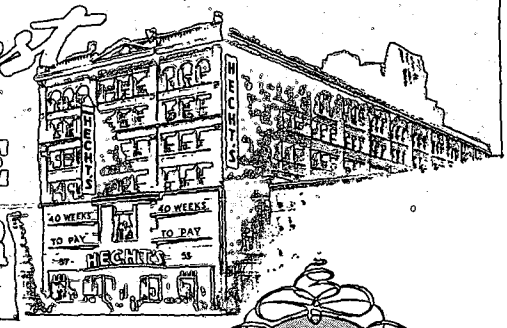
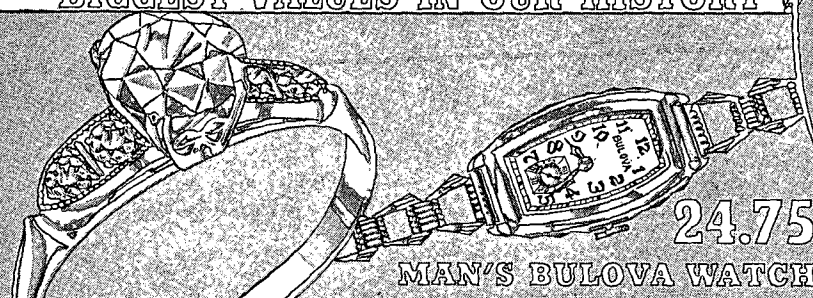
SINCE 1892



$1 delivers these gorgeous DIAMONDS and WATCHES

BIGGEST VALUES IN OUR HISTORY

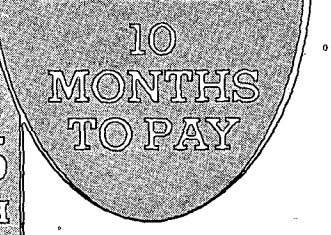
Pay as LITTLE AS **10¢ A DAY** 10 MONTHS TO PAY



½-CARAT* DIAMOND ENGAGEMENT RING

H-103—a beautifully brilliant blue white diamond with smaller surrounding diamonds. Specify whether you want 14-kt. white or natural gold. *approx. wt.

$7.80 a month



24.75 MAN'S BULOVA WATCH

H-104—famous "Ranger" model, 15-jewel, natural gold plate. Secure-proof clasp on matching link band.

$2.38 a month

29.95 BRIDAL ENSEMBLE

H-100—14-kt. fine blue white diamond engagement ring, set with four smaller matching diamonds; 14-kt. wedding band set with diamonds. Specify choice of white or natural gold.

$2.90 a month

11.95 MAN'S ONYX INITIAL RING

H-102—a massive ring with blue white diamond, finely chased design. Not a boy's ring. Give initials.

$1.10 a month

29.75 WOMAN'S BULOVA WATCH

H-105—famous "Lady Bulova" model, 17-jewel, natural gold plate. Newest tiny square model. Silk cord with clasp.

$2.88 a month

ENGAGEMENT RING

H-101—set with fine blue white perfectly cut diamond, and three smaller matching diamonds on each side. Choice of 14-kt white or natural gold. $3.90 a month

10 DAYS' FREE TRIAL

MONEY-BACK GUARANTEE

Now, for as little as 10c a day, paid monthly, the beautiful diamond ring and watch you've always wanted to own! Just put a dollar bill in an envelope with your name, address and number of the article you want. Tell us your age (you must be over 20), your job, the name of your employer, how long you've worked for him, and any other facts you care to give. All information held confidential; no embarrassing inquiries will be made. Then we'll open the account for you, send you your selection on 10-days' approval. If you're not satisfied, return the jewelry and we'll refund your dollar. If satisfied, pay the balance in 10 small monthly payments. Mail your order and $1 today.

HECHT'S

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NEW YORK CITY

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How to Make YOUR Body Bring You FAME ...Instead of SHAME!

ARE YOU Skinny? Weak? Flabby?

I'll PROVE in 7 DAYS I Can Give YOU a Prize-Winning Body Like Mine

I KNOW what it means to have the kind of body men laugh at and women scorn! Of course, you wouldn't know it to look at me *now*, but I was once a skinny weakling who weighed only 97 lbs! I was *ashamed* to strip for sports or undress for a swim. I had no *build*, no *strength*, no *pep*. I was only HALF-ALIVE.

Then I discovered the amazing secret that turned me into "The World's Most Perfectly Developed Man." And the same system that worked such wonders for me can make a NEW MAN of YOU! Just as it has put pounds of firm flesh and inches of powerful muscle on thousands of other men, young and old.

JUST GIVE ME 7 DAYS

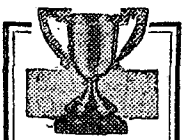
What's more—I GUARANTEE to show you astonishing *results* that you can *see* and *feel* in your own body within just SEVEN DAYS! In just one week you'll feel bulging new muscle pushing up your chest. Then I get to work filling out your arms, shoulders, legs—strengthening your waist-line—turning you into a real HE-MAN who's ready for lightning-fast sport or hard-hitting fight at the drop of a hat!

In just one week I'll show you what my system of *Dynamic Tension* can do for YOU, right in your own home! It's the quickest, easiest, *surest* way to get a build you'll be *proud* of—a handsome, husky physique with champion muscles that will amaze every man who sees them!

I USE NO "APPARATUS"

My remarkable, quick-results method does away with all apparatus. I have no *use* for dangerous contraptions that might strain your heart or other vital organs. I use no pills, "rays," or freak diets. My *Dynamic Tension* is the *natural* method of developing you *inside and out*. It not only gives you a master body *fast*, but it goes right after such conditions as constipation, pimples, skin blotches and such health-handicaps that shut you out from the good times of life.

Find out how—FREE! It costs you only a stamp—even a post-card will do—to mail the coupon below. I'll send you at once, without cost, a complete copy of my new, illustrated book, *"Everlasting Health and Strength."* In plain English it tells exactly what my special *Dynamic Tension* method can do for *your* condition. It shows you, from actual photos, how I have developed my pupils to the same perfectly balanced proportions of my own physique, by my own secret methods. And what I have done for them I am ready to do for *you*. Understand—I *guarantee to prove* that in just *one week!*



THIS STERLING SILVER CUP BEING GIVEN AWAY

This valuable cup stands about 14 inches high on a black mahogany base.

I will award it to my pupil who makes the most improvement in his development within the next three months.

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A free copy of *"Everlasting Health and Strength"* is ready and waiting for you right now. Where shall I send it? Write your name and address carefully on this coupon and mail it *today*. This is your quick way to get the best-built, huskiest, handsomest body of any fellow in your crowd—so don't delay! Rush coupon to me personally. Charles Atlas, Dept. 7712, 115 E. 23rd St., New York, N. Y.

Charles Atlas

As he looks today from actual, untouched snapshot. Holder of Title, "The World's Most Perfectly Developed Man."

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115 East 23rd St., New York, N. Y.

I want proof that DYNAMIC TENSION will make a new man of me—give me a healthy, husky body and big muscle development. Send me your free book, "Everlasting Health and Strength."

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(Please print or write plainly)

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THRILLING WONDER STORIES

The Magazine of Prophetic Fiction

VOL. 10 NO. 3

December, 1937

IN THE NEXT ISSUE

LIFE ETERNAL
A Novelette of Solar Secrets
By
EANDO BINDER

ZONES OF SPACE
A Novelette of the Sunken World
By
MAX C. SHERIDAN

DREAM-DUST FROM MARS
A Novelette of the Future
By
MANLY WADE WELLMAN

A SPECIAL ARTICLE ON ASTRONOMY
By
SIR JAMES JEANS

—Plus many other unusual novelettes, stories and features.

EVERY STORY BRAND-NEW

Table of Contents

COMPLETE NOVELETTES

A MONTH A MINUTE
By RALPH MILNE FARLEY 14

THE TENTH WORLD
By JOHN W. CAMPBELL, JR. 36

THE MIND MAGNET
By PAUL ERNST 74

THRILLING SHORT STORIES

RED SHARDS ON CERES
By RAYMOND Z. GALLUN 27

BEYOND THAT CURTAIN
By ROBERT MOORE WILLIAMS 65

WHEN SPACE BURST
By EDMOND HAMILTON 90

THE BLOODLESS PERIL
By WILL GARTH 100

SPECIAL ARTICLE

EIGHT DAYS IN THE STORY OF ROCKETRY
By WILLY LEY 56

SPECIAL FEATURES

SCIENTIFACTS
By J. B. WALTER 53

IF—(A Picture Feature)
By JACK BINDER 89

OTHER DEPARTMENTS AND FEATURES

THE "SWAP" COLUMN 12
TEST YOUR SCIENCE KNOWLEDGE 33
FORECAST FOR THE NEXT ISSUE 99
SCIENCE QUESTIONS AND ANSWERS 110
SCIENCE FICTION LEAGUE 113
THE READER SPEAKS 118
THE STORY BEHIND THE STORY 125

ON THE COVER

The two alien races that inhabit the stratosphere, the Squares and the Rounds, struggle for supremacy in a strange scientific duel. This painting depicts a scene in Paul Ernst's novelette, THE MIND MAGNET.

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Names of all characters used in stories and semi-fiction articles are fictitious. If a name of any living person or existing institution is used, it is a coincidence.

Manuscripts must be accompanied by self-addressed, stamped envelopes, and are submitted at the author's risk.

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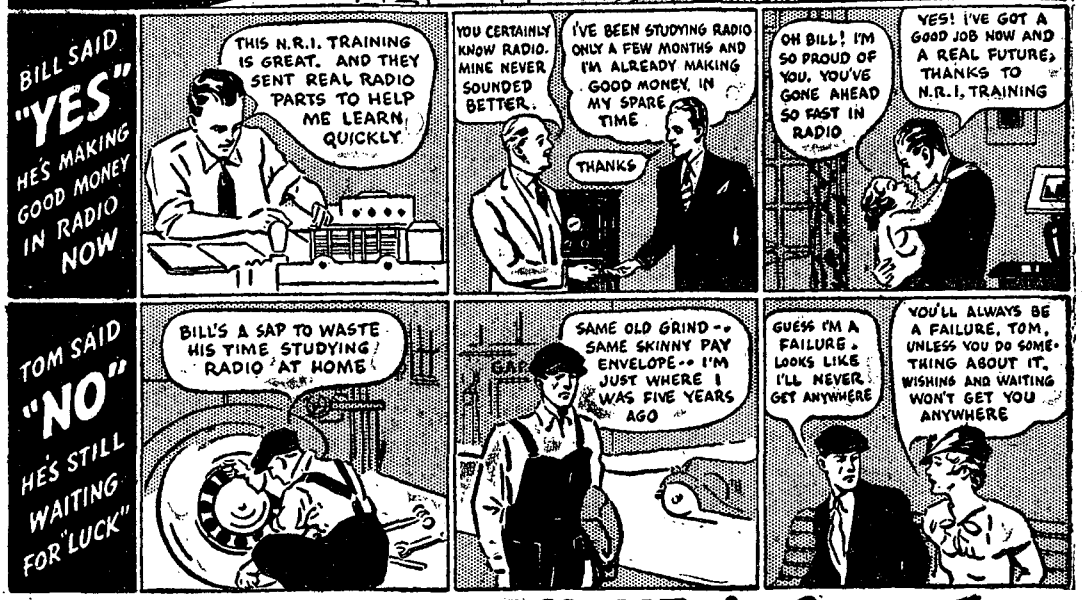
YES- I'M CONVINCED THAT I CAN MAKE GOOD MONEY IN RADIO. I'M GOING TO START TRAINING FOR RADIO RIGHT NOW.
NO- NOT ME. I'M NOT GOING TO WASTE MY TIME. SUCCESS IS JUST A MATTER OF LUCK AND I WASN'T BORN LUCKY.


BILL SAID "YES" HE'S MAKING GOOD MONEY IN RADIO NOW
THIS N.R.I. TRAINING IS GREAT. AND THEY SENT REAL RADIO PARTS TO HELP ME LEARN QUICKLY.
YOU CERTAINLY KNOW RADIO. MINE NEVER SOUNDED BETTER.
I'VE BEEN STUDYING RADIO ONLY A FEW MONTHS AND I'M ALREADY MAKING GOOD MONEY IN MY SPARE TIME
THANKS
OH BILL! I'M SO PROUD OF YOU. YOU'VE GONE AHEAD SO FAST IN RADIO
YES! I'VE GOT A GOOD JOB NOW AND A REAL FUTURE, THANKS TO N.R.I. TRAINING
TOM SAID "NO" HE'S STILL WAITING FOR "LUCK"
BILL'S A SAP TO WASTE HIS TIME STUDYING RADIO AT HOME
SAME OLD GRIND -- SAME SKINNY PAY ENVELOPE -- I'M JUST WHERE I WAS FIVE YEARS AGO
GUESS I'M A FAILURE. LOOKS LIKE I'LL NEVER GET ANYWHERE
YOU'LL ALWAYS BE A FAILURE, TOM, UNLESS YOU DO SOMETHING ABOUT IT. WISHING AND WAITING WON'T GET YOU ANYWHERE

I WILL TRAIN YOU AT HOME *in Spare Time*

FOR A GOOD RADIO JOB

J. E. SMITH, President
National Radio Institute
Established 1914

Many Radio Experts Make $30, $50, $75 a Week

Do you want to make more money? Broadcasting stations employ engineers, operators, station managers and pay up to $5,000 a year. Spare time Radio set servicing pays as much as $200 to $500 a year—full time servicing jobs pay as much as $30, $50, $75 a week. Many Radio Experts operate full time or part time Radio businesses. Radio manufacturers and jobbers employ testers, inspectors, foremen, engineers, servicemen, paying up to $6,000 a year. Radio operators on ships get good pay, see the world besides. Automobile, police, aviation, commercial Radio, and loud speaker systems offer good opportunities now and for the future. Television promises many good jobs soon. Men I trained at home have good jobs in all these branches of Radio.

Many Make $5, $10, $15 a Week Extra in Spare Time While Learning

Almost every neighborhood needs a good spare time serviceman.

The day you enroll I start sending Extra Money Job Sheets showing how to do Radio repair jobs. Throughout your training I send plans and ideas that made good spare time money for hundreds. I send Special Equipment to conduct experiments, build circuits, get practical experience. I GIVE YOU A COMPLETE, MODERN, PROFESSIONAL ALL WAVE, ALL PURPOSE RADIO SET SERVICING INSTRUMENT TO HELP SERVICE SETS QUICKER—SAVE TIME, MAKE MORE MONEY.

Find Out What Radio Offers You

Mail the coupon now for "Rich Rewards in Radio." It's free to any fellow over 16 years old. It points out Radio's spare time and full time opportunities, also those coming in Television; tells about my training in Radio and Television; shows you letters from men I trained, telling what they are doing, earning; shows my Money Back Agreement. MAIL THE COUPON in an envelope or paste it on a penny postcard—NOW!

J. E. SMITH, President
National Radio Institute,
Dept. 7NO9
Washington, D. C.

J. E. SMITH, President
National Radio Institute, Dept. 7NO9
Washington, D. C.

Dear Mr. Smith: Without obligating me, send "Rich Rewards in Radio," which points out the spare time and full time opportunities in Radio and explains your 50-50 method of training men at home in spare time to become Radio Experts. (Please Write Plainly.)

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ADDRESS.....

CITY..... STATE.....

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TOUGH ON OIL COMPANIES
But A BOON TO MOTORISTS

Amazing new mineral plating saves up to 50% on oil*... increases gas mileage up to 45%*... adds new pep, speed and quiet... all at a fraction of new ring and rebore cost. Coupon below brings you sample free!

A miner's chance discovery plus scientific research are responsible for Ovrhaul—"The modern way to recondition your motor." The action of this *amazing mineral* (motor heat expands it up to 30 times) is astonishing. This patented mineral plating process threatens to revolutionize the cost of motor upkeep. Already nearly a quarter of a million car owners are using Ovrhaul in place of new ring and rebore jobs.

OVRHAUL YOUR MOTOR IN 30 MINUTES

At a cost less than spark plugs and in only 30 minutes' time, you can place OVRHAUL in your cylinders and start reaping the benefits of this amazing invention. No special tools needed—no car tie-up—no danger of ruining your motor by grinding the cylinder walls.

*Some users report even greater savings, however let us send you Impartial Certified Laboratory tests which prove conclusively what Ovrhaul is doing.

Solves a 25 Year Old Problem

Since motor cars were first invented—OIL WASTE, LOW GAS MILEAGE, LOW COMPRESSION, LOST POWER and NOISY MOTORS, *caused by worn rings and cylinders*, have brought great expense to car owners. Before Ovrhaul, it was necessary to put in new rings and rebore the cylinders, *costing up to $150.00.* Now—a single application of Ovrhaul quickly checks oil waste—increases gas mileage and compression and adds new power, pep, speed and quiet, all at a fraction of the cost of new rings and reboring.

MONEY MAKING TERRITORIES OPEN

FOR SALESMEN AND DISTRIBUTORS WHO ACT QUICK!

Salesmen and Distributors are cashing in Big with Ovrhaul. It is so revolutionary—so positive in its action—so new and different and saves the motorist so much money—*that representatives say* OVRHAUL is the quickest seller and biggest profit-maker they have had in years. Not a gasoline dope, nor gadget. Does not contain graphite or harmful abrasives. 18 million car owners need Ovrhaul. If you want in on this, send the coupon opposite or a penny post card and

TESTING LABORATORY REPORT

"We hereby certify that we have tested OVRHAUL UNDER WORKING CONDITIONS with these results: Test made on 1928 Pontiac driven 72,000 miles. TOTAL GAIN in compression 92 pounds (nearly normal according to manufacturer's specifications). OVRHAUL does NOT scratch, abrade or otherwise injure the motor. The 'pick-up' speed, and hill climbing performance were increased ENORMOUSLY. Car runs practically as well as when new."

Industrial Testing Laboratory, Inc.

SAMPLE FREE!

If you would like to try this amazing mineral discovery without risk, use the coupon below or send a 1-cent POSTCARD for free sample to

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OVRHAUL CO.
R-912, Kansas City, Mo.

Let Me Help You!

I built a sales organization that sold over a million automobile tires and tubes. I took untrained and *trained men and taught them how to* sell profitably. Ovrhaul in my judgment has greater possibilities than anything I have seen in the past 10 years. Join hands with me—a splendid business with quick profits should be yours. Start today by mailing the coupon for *free sample.*

Free SAMPLE COUPON

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Without cost or obligation, send me at once a FREE SAMPLE. Also show me your big money-making plan.

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Address.....

City..... State.....

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K223—Attractive 17 jewel watch with case in charm and color of natural gold. Guaranteed to give you satisfaction. Regular $30 value.

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P137—Newest square watch in white with 2 diamonds. Guaranteed 7 jewel movement. Complete with black silk cord band. Would ordinarily sell for as high as $30

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M211—Bulova's new feature—the Minute-Man. 17 jewel curved watch in charm and color of natural gold. Leather strap.

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Think of it — as little as 10c a day (paid monthly) will enable you to own one of these beautiful Diamonds or Watches. I'll send your choice of these bargains for approval and 10-day trial. Simply put a dollar bill in an envelope with your name, address and number of the article wanted. Tell me your age (must be over 20), occupation, employer and a few facts about yourself. Information held confidential — no direct inquiries will be made. I'll open a 10-month Charge Account for you and send selection for approval. If you are not satisfied, send it back and I'll refund your dollar. If satisfied, pay balance in 10 small monthly payments. Send your order today.

$29.75

R126—Bulova's newest feature — the Lady Bulova—a tiny 17 jewel watch in charm and color of natural gold.

$2.88 a month

$29.75

A29/C15—Matched Bridal Ensemble consisting of 5 diamond engagement ring and 5 diamond wedding ring. Both 14K white gold. Exceptional value

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A157—A gorgeous new 14K white gold engagement ring. Large center diamond with 2 other diamonds. Regularly $40.

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A334—Sworn Perfect diamond with 4 other diamonds in newest 14K natural gold engagement ring. Affidavit of Perfection with purchase Regular $75 value

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K22—Good-looking guaranteed watch for men Unique style with numerals on case in enamel background 7 jewels Leather strap

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J186—Massive initial ring for men. 10K natural gold with diamond and initials in white gold on genuine black onyx A real bargain at this low price.

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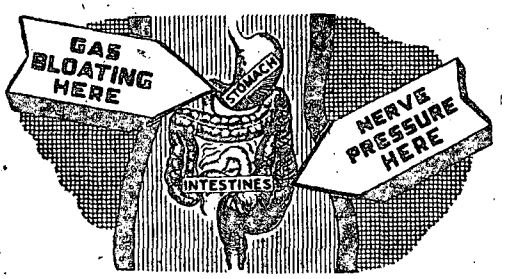
What Two Things Happen When You Are *Constipated?*



When you are constipated two things happen. FIRST: Wastes swell up the bowels and press on nerves in the digestive tract. This nerve pressure causes headaches, a dull, lazy feeling, bilious spells, loss of appetite and dizziness. SECOND: Partly digested food starts to decay forming GAS, bringing on sour stomach (acid indigestion), and heartburn, bloating you up until you sometimes gasp for breath.

Then you spend many miserable days. You can't eat. You can't sleep. Your stomach is sour. You feel tired out, grouchy and miserable.

To get the complete relief you seek you must do TWO things. 1. You must relieve the GAS. 2. You must clear the bowels and GET THAT PRESSURE OFF THE NERVES. As soon as offending wastes are washed out you feel marvelously refreshed, blues vanish, the world looks bright again.

There is only one product on the market that gives you the double action you need. It is ADLERIKA. This efficient carminative cathartic relieves that awful GAS at once. It often removes bowel congestion in half an hour. No waiting for overnight relief. Adlerika acts on the stomach and both bowels. Ordinary laxatives act on the lower bowel only.

Adlerika has been recommended by many doctors and druggists for 35 years. No griping, no after effects. Just QUICK results. *Try Adlerika today.* You'll say you have never used such an efficient intestinal cleanser.

WARNING!

All REPUTABLE DRUGGISTS know that Adlerika has no substitute. Always DEMAND the genuine.

CLIP COUPON NOW!

Adlerika Co., Dept. T-F—12-7
St. Paul, Minn.

Gentlemen: Send without obligation your FREE Trial Size of Adlerika. Limit one to a family. (Offer good in U. S. only)

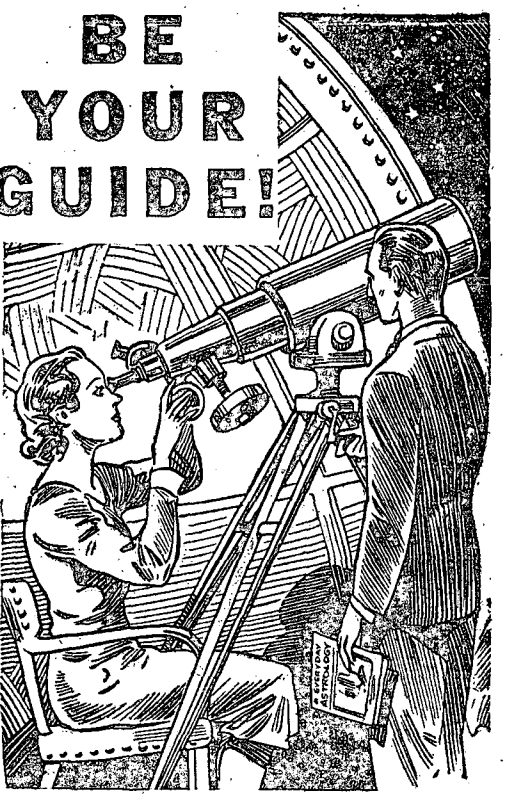
Sold in Canada by leading druggists

Name .....

Address .....

City..... State.....

LET the STARS BE YOUR GUIDE!



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New 6-Volt TRINDL Electric ARC WELDER

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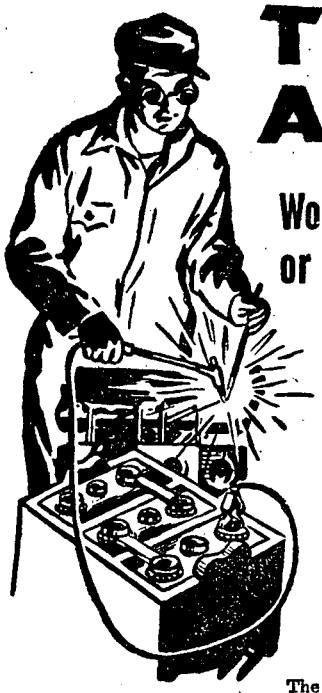

Works on Storage Battery or 110 Volt Light Circuit

A REAL WELDER

Men, here is the hottest specialty item that has come along in years. A real honest to goodness electric arc welder that does a man size job. Built sturdily of the finest materials. Requires no mechanical knowledge—any one can use it. Every demonstration should make a sale. This new Trindl Electric Arc Welder is made possible by the invention of a low voltage carbon which gets white hot from the current of an ordinary 6 volt storage battery such as in your automobile. It only uses about 20 to 25 amperes of current which is about the same current drain as 4 headlight bulbs, yet develops about 7000 degrees of heat.

MELTS IRON AND STEEL INSTANTLY

The Trindl Welder is simple to use. Expert welding can be done by anyone. The Trindl Arc Welder is the only battery welder that, after a rigid test, has been approved by the Automotive Test Laboratories of America. It is ideal for making permanent fender repairs—also for broken castings, radiators, cylinders, water jackets, holes in auto bodies, hog troughs, boilers, tanks, milk cans, radios, batteries, etc. Iron, Steel, Brass, Copper and Tin can be worked on for a quick and permanent repair. The repaired part will be as strong as before.

NEW 110 VOLT CONVERTER MAKES FULL SIZE PROFESSIONAL UNIT

This new converter is used on any 110 volt 60 cycle electric light socket in place of a storage battery. It is especially designed to be used with the Trindl Electric Arc Welder—COSTS LESS THAN A GOOD BATTERY—The combination makes a full size professional electric arc welder that everybody can use. Ideal for fender and repair shop needs. This is a sensation, not only in price but also in actual results. The converter represents the same fine construction and engineering skill as the arc welder. The complete outfit, including the transformer, is easily portable so that it can be brought right to the job.

USERS SWEAR BY IT—The price is so low that now anyone can afford to have a real welding outfit. Think of the profit you can make introducing this Trindl Welder and Converter—a simple five minute demonstration should make a sale to every interested prospect, especially when they hear the amazingly low price. Garages, radio and battery men, tinners, sheet metal workers, janitors, farmers and home-owners all need the Trindl Welder and Converter.

ACT NOW! There are big profits and a steady business waiting for you taking care of your territory for us. Don't let someone else get in before you—Send coupon Today.

TRINDL PRODUCTS

2229-WE Calumet Ave., Chicago, Ill.

$2.50 WHOLESALE

FACTS

Here are just a few excerpts from the many letters of praise we have received from Trindl Electric Arc boosters.

"Please find enclosed for 12 welders by return mail for I am about sold out now. They are selling fine."—W. C. Anderson, Nebr.

"Received my Trindl Arc Welder and am both pleased and surprised."—Louis F. Glier, Ohio.

"Results are very gratifying with your welder. I am enclosing an order for 12 more Electric Arc Welders." — Nelson O. Lyster, Florida.

"I received my welder, and it is a regular repair shop in itself." —J. R. Harper, La.

"I sold 4 of your Trindl Electric Arc Welders in three minutes." —C. Gillies, Canada.

"I sold 9 welders in my first ten calls."—F. W. Stice, Iowa.

$10.50 a day profit for you for only selling 6 Trindl Arc Welders. No matter where you turn, you will find people who will want to buy arc welders from you. Garages, shop men, radio repair men, farmers, home-owners, mechanics, janitors, all of them need Trindl Electric Arc Welders. Be the man in your territory to clean up with Trindl.

MAIL COUPON NOW!

TRINDL PRODUCTS
2229-WE Calumet Ave.
Chicago, Illinois

Yes! Rush me free particulars of how I can make big money with Trindl Electric Arc Welders and Converters. This does not obligate me in any way.

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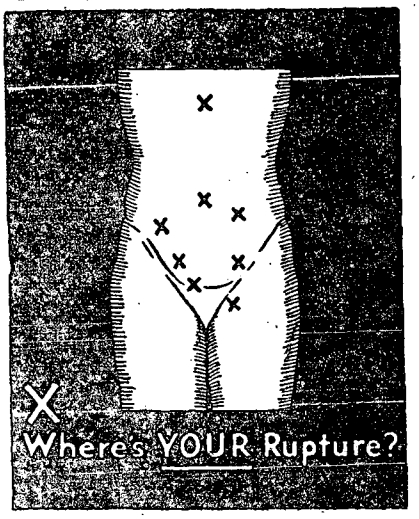

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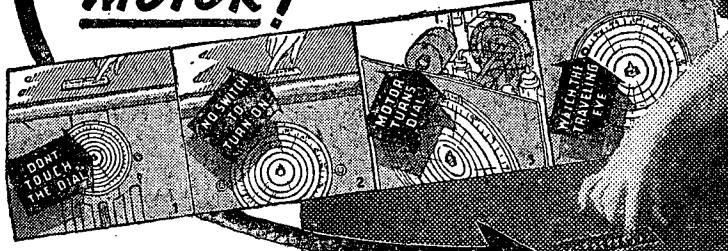

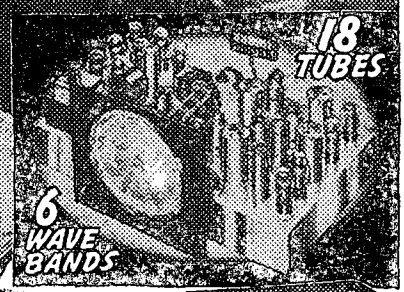

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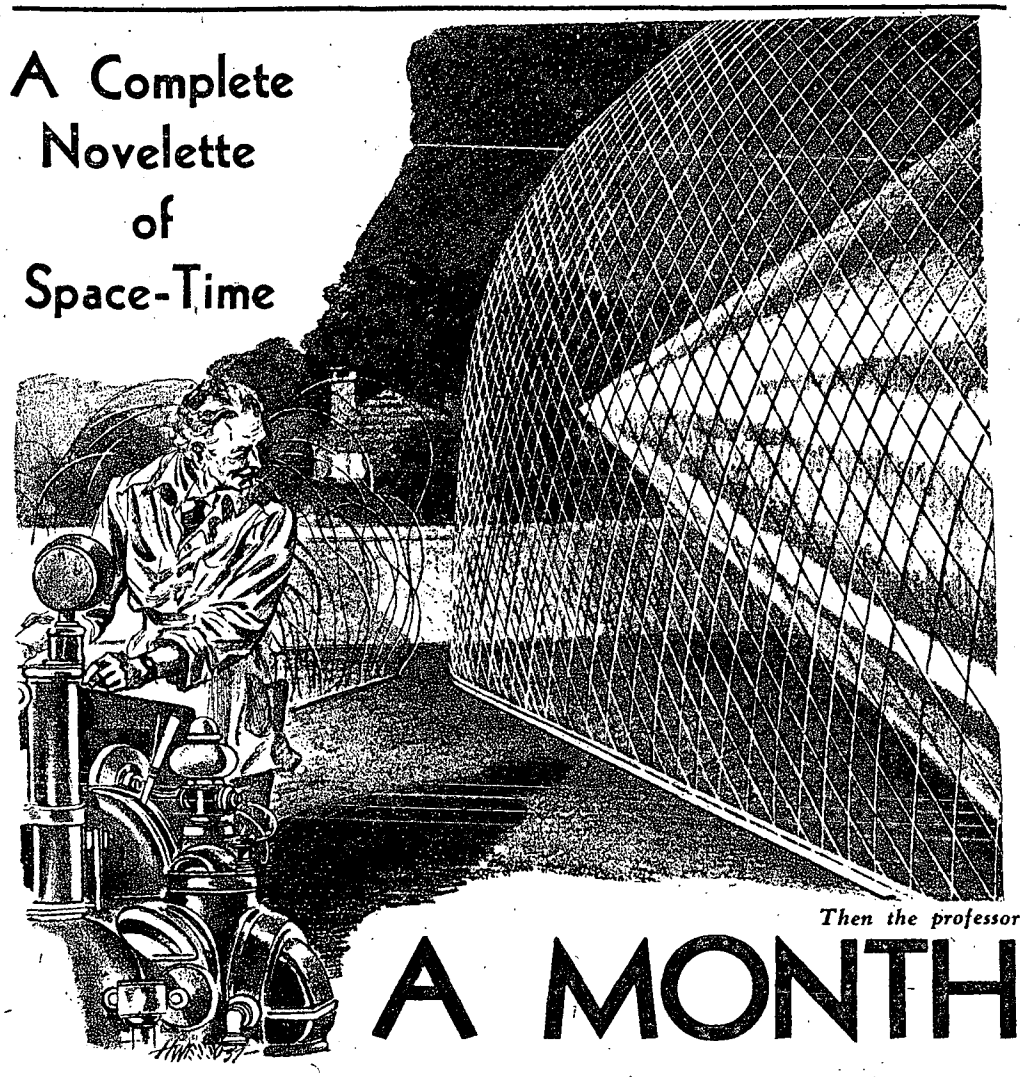

Then the professor

A MONTH

CHAPTER I

61 Cygni

YOUNG Benson Crocker shifted his well-built body in the easy chair and addressed the elderly scientist before him.

"I can understand why, Professor, if you give the space ship a sudden impulse, like that given to a bullet by a gun, it would instantly smash the man in the ship to pulp; but, if the acceleration were built up gradually —"

"Bah!" spat Professor Porter, his high-domed forehead contorting into a frown. His lame leg, resting stiffly on the stool in front of his chair, seemed to stiffen even more. "What you're thinking of is *velocity*. If you had given serious attention to your mathematical physics, instead of being satisfied with the lowest grade which would still permit you to play

Supernal Forces Catapult Two Lone Space

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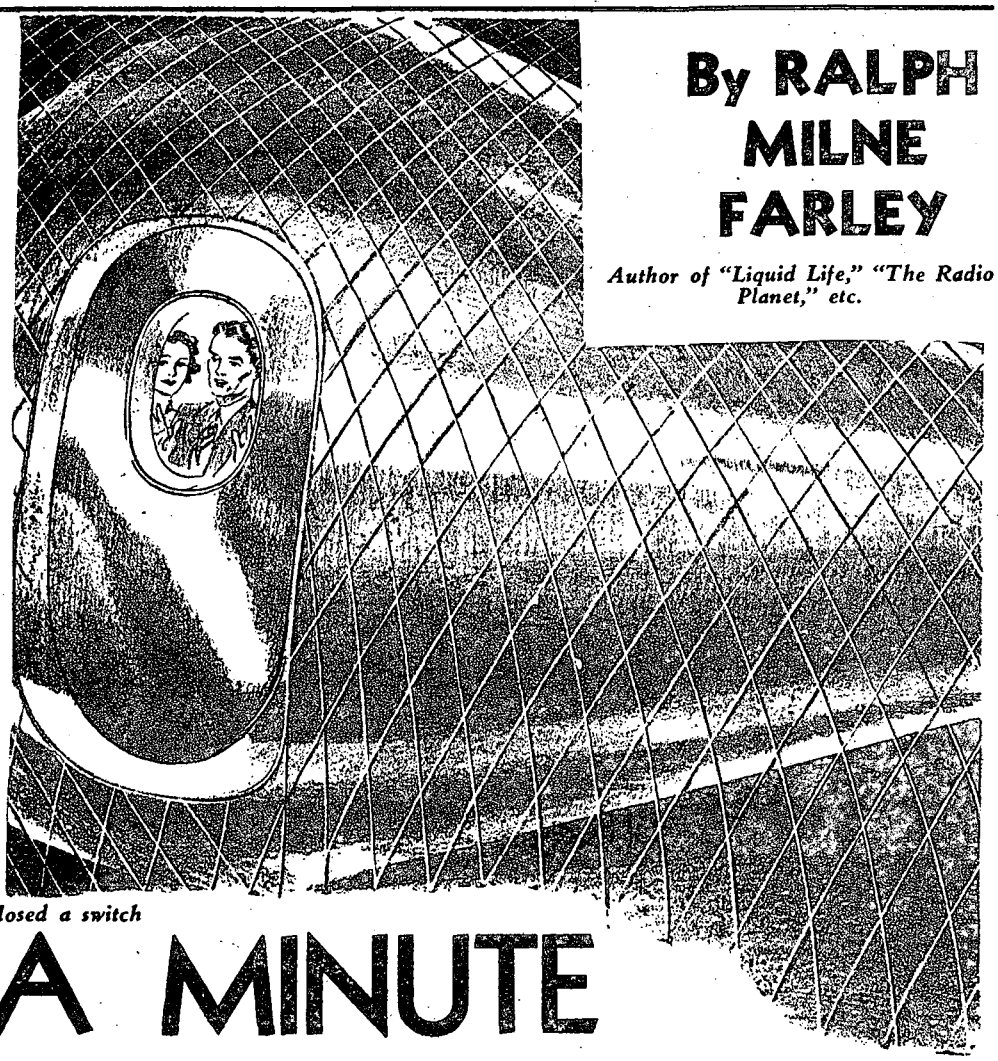
Only Chance Was to Follow the Stars!



By RALPH MILNE FARLEY

Author of "Liquid Life," "The Radio Planet," etc.

closed a switch

A MINUTE

football, you would realize that force always equals mass times acceleration, regardless how slowly the acceleration is built up. An acceleration of one mile per second squared would cause a one-hundred-and-eighty-pound young man such as yourself to weigh almost exactly fifteen tons—quite an unbearable weight."

"But there must be *some* way in which to build up sufficient velocity for interstellar travel," Crocker persisted.

"There is!" The old professor paused dramatically. "I have discovered a new scientific principle. Not only that, but I have built a space ship to utilize my new principle. You are to be the first person in all the world to whom I shall disclose it. That's why I invited you over here this evening."

"Me! Why me?"

"Because, Crocker, I like you.

Voyagers into an Uncharted, Timeless Void

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Strange, is it not, that I, a physicist, should like you, a mere football player, who nearly flunked one of my courses!"

Benson Crocker grimaced.

"What stumps me, sir, is the theoretical part of the subject. I do all right in the practical applications, don't I?"

"Yes, Ben, you do. And perhaps that's why I like you! At any rate, let's say that that's why I chose you as the first person with whom to discuss my new theory. I want to subject it to the scrutiny of a practical mind; for my space ship will have to be practical if it is to succeed."

"All right, sir."

The professor's pale blue eyes glowed in deadly earnest.

"Do you recall enough of your freshman course in analyt to remember what a 'minimal line' is?"

But Crocker was not listening, for just at that moment his keen grey eyes, roaming the room, had fallen upon the tinted photograph of a golden-haired blue-eyed girl of about his own age. And so, as he studied the picture, the dissertation of the old professor rumbled into the background of Crocker's thoughts.

The girl *was* beautiful! Probably the credit was all due to photographic retouching, for the face of the girl in the picture was an unusually attractive one. Crocker studied each contour and lineament with appraising incredulity.

Who was this sweet wistful vision of loveliness, he wondered. Not Porter's daughter, certainly, for the codger was too old to have a daughter as young as she. His granddaughter? Or perhaps his grandniece?

Crocker's conjecture as to the relationship of this girl to his host caused his attention to flash back to the old professor, just in time to hear the latter say: —"And so we don't have to decide whether light is a pulse or a wave, inasmuch as the two are the same on a line which is perpendicular to itself at every point along its entire length. That's my own addition to Eddington's theory!"

"Wonderful, sir!" Crocker exclaimed, with a forced pretense at intense interest.

Beaming with gratification, Professor Porter continued.

"As you know, velocity equals distance divided by time. If some method could be invented to interchange distance and time, the ratio would be inverted, and any object which was traveling slowly would suddenly find itself traveling at a phenomenal rate—and without having undergone any damaging acceleration. This method I have devised and used as the principle of my new space ship. To effect this change, all that is necessary is to make a 90° shift of the coordinated axis of space and time."

"But doesn't that take tremendous force?"

"Not at all! Inasmuch as the line of travel of any object through space-time is a minimal line, and as a minimal line is at right angles to itself, the shift requires no force at all!"

JUST then the door of the study opened, and in walked the girl of the picture. Crocker stood up unsteadily. The picture had not been a retoucher's masterpiece after all. He stared rudely at the girl; she flushed with embarrassment, then glanced inquiringly at the professor.

"Oh—ah—my dear," he said, "this is one of my students, Mr. Benson Crocker. Crocker, this is my granddaughter Iralene, just back from school in the East."

Crocker murmured something incoherent. The girl smiled impishly.

They sat down. To cover his embarrassment, Crocker turned to his host and asked the first question which popped into his head.

"What would life be like," he asked, "with space and time interchanged?"

This turned out to be just the right sort of question to start the old man off on an enthusiastic lecture. Iralene leaned forward and listened intently. Crocker studied her with equal intentness.

"Of course, you realize," the professor explained, "that it is only *one* of

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the three space dimensions that gets interchanged with time, namely the one along which the object is moving. Velocity remains velocity, but with a greatly altered speed. Acceleration in the line of travel becomes seconds per feet squared. Specific gravity becomes the ratio between two sectional densities. Angular velocity becomes any one of three different things, depending on—"

But Crocker had ceased to listen. He was more interested in Iralene Porter than in mathematical physics. When Professor Porter's declamatory voice next obtruded itself upon Crocker's consciousness, the old man was concluding with, "Shape, weight, smell, heat, electricity—everything—will be converted into something new. The human mind cannot conceive what it would be like to experience these new dimensional combinations. I wish that some day I might experience them."

"But won't you know," Crocker pointed out, "when you take the trip in your space ship?"

A queer light came into Porter's pale eyes.

"Yes and no," he replied. "Within the space ship all will seem unchanged, for the senses will have undergone the same transformation as the things observed. The ship will be traveling too fast for the outside world to observe changes in it. And, looking out through the fused-quartz windows of my ship, all that one will be able to see would be the stars—and I have not yet figured out what changes pinpoints of light will undergo under my transformation."

"Where do you intend to go?" Crocker asked.

"For the present, merely upstairs," Porter replied cryptically. "Come on. I'll show you my apparatus."

He grasped the knee of his stiff leg with both hands, lifted it off the stool, and planted his foot on the floor. Then, picking up the cane which leaned against his chair, he arose, and led the way to his attic laboratory. Thence up a ladder—one rung at a time, drawing his stiff leg after him—and through a trapdoor onto the starlit flat roof.

The professor threw a wall switch, flooding the place with light. On a pedestal a small model of what looked like a submarine, surrounded by a mesh of fine insulated wire, came into view.

"See that little space ship?" he announced, with a wave of his hand. "Those wires, when energized, interchange space and time within their field. Observe!"

He pushed a button on the side of the pedestal. The tiny space ship vanished. The maze of wires hung torn and disrupted.

"Where has it gone?" Crocker exclaimed.

"Hurtling off into space, with unbelievable velocity. And now observe this one." The professor removed the cover from an apparently identical enmeshed model on an identical pedestal. He pushed a button. Nothing happened.

"What's the matter?" Crocker asked.

PROFESSOR PORTER grinned. "Everything's okay," he replied. "This little ship has apparatus within it to set up a neutralizing field. I turned on both fields simultaneously, and so of course nothing happened."

"Say, here's an idea, sir," Crocker suggested, with one eye on the girl, to note her reaction. "Why don't you turn on the neutralizing field a thousandth of a second after you turn on the first field? By measuring just how far and in what direction your model traveled in that brief interval, you would have a complete check on your theory."

"My theory needs no check!" the professor asserted, drawing himself erect. Then softening, "Yet it *would* be interesting to try. I have a successive-contact button on the desk here. It will take only a minute to hitch it up. Of course it will not enable us to measure the time interval, but at least it will give us a qualitative test."

The scientist deftly made the sub-

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stitution. Then he pressed the newly installed button.

But nothing happened. He frowned.

"Perhaps," Crocker suggested, "you pushed so quickly that the first field got neutralized before it put in its effect."

"Perhaps," the professor agreed. "All right. I will try again more slowly."

He pushed the button more gingerly. The three persons gasped.

The little ship was gone, its wire cage wrecked, and the conduit which supplied current to its insides, snapped off.

Professor Porter stared for a moment, then glanced hurriedly at his wrist-watch.

"Come," he said. "I will show you my full-sized ship."

He removed a canvas covering from a bulky object, disclosing a spindle-shaped form of glistening chromium-plate about ten feet high and thirty feet in length, within a network of wires. Then he removed the covering from a small object, disclosing a bank of switches and clockwork.

"I have computed, to a millionth of a second," he explained, "the exact instant at which the combined effect of the rotation of the earth, the motion of the earth in its orbit about the sun, the rotation of the galaxy of which the Solar System forms a part, the drift of the entire galaxy through space, and whatever independent motion the sun may have within the galaxy will be carrying this laboratory toward 61 Cygni, one of the nearest stars, about ten light-years away, at the comparatively slow speed of 244,000 miles per hour. At exactly that instant, provided that my master switch has first been closed, my time-clock will energize this field, and my ship will shoot off at a speed faster than light, almost directly toward that distant star."

"May I ask," the athlete interrupted, "why you didn't pick out some nearer star? Aren't there some—"

"Only one is appreciably nearer, namely Alpha Centauri, four light years away; but no point on the surface of the earth ever moves even approximately toward Alpha Centauri."

"That's almost incredible!" Crocker exclaimed. "I should think—"

"You would think that there would be some time of the day or year at which some spot on the earth would be moving toward almost any given point in the sky. But you forget the galactic drift, so stupendous as to render almost insignificant the minor motions of the earth. And so I say that no spot on the earth moves except toward one very small portion of the sky. It is indeed fortunate that a star even as near as 61 Cygni lies within this small portion. Furthermore, my ship will be traveling at about 2750 times the speed of light, and so will traverse the ten light-years in just a bit less than a day.

"My ship contains the means for stopping, for changing the direction of its travel, and for landing gently on any planet which 61 Cygni may possess. Now, would you both like to step inside?"

CHAPTER II

The Fallacy

THERE was a small gap in the surrounding mesh of wires, beyond which was an opened door in the side of the spindle-shaped ship.

Crocker motioned Iralene Porter to precede him, and the two crawled through the wires and entered the ship.

Within, it truly resembled a ship. There was a berth along each side; a hanging folding table in the middle; bookcases and cupboards on the walls; circular portholes.

Suddenly the door slammed behind them. Impelled by some instinctive fear, Crocker wheeled and seized the handle. It turned easily—too easily. But the door would not open.

Peering frantically through the circular window in the door, he saw Professor Porter, smiling reassuringly, waving to him. Then the pro-

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fessor glanced at his wrist-watch, and limped over to the control table, where he closed a switch.

Holding his wrist-watch up before his eyes, he raised his right hand as though for a signal; then stared expectantly at the space ship.

Horrified, Crocker stared back. He felt Iralene behind him, clutching his arm. Then, suddenly, before their retinas registered it, they realized that the rooftop on which the ship had stood was gone. They were out in space.

"Well, I'll be damned!" Crocker exclaimed, drawing back from the porthole. For a full minute he stood stunned; then turned, and faced the girl.

Iralene shrugged her pretty shoulders.

"Well, Mr. Crocker," she said airily, "here we are, hurtling through space, toward the Swan."

"Toward the what?"

"Toward Cygnus—the constellation of the Swan."

Crocker swore softly.

"So we're to take a swan-dive, are we? Just because that old fool of a scientific maniac—"

"He was foolish enough to let you pass his course!"

"Now look here!" Crocker said sharply. "We're in a jam. If that old idiot's theories are correct, we are due to arrive at 61 something-or-other in about twenty-three hours; and so, if we don't hurry up and figure out what to do when he get there, this swan-dive of ours is likely to prove a swan-song. In other words, my pet, we have less than a day in which to figure out how to stop this perambulator or else we'll keep on cruising through space forever."

"Forever?" The girl's voice broke with horror.

Crocker raised his eyebrows.

"Well, not exactly forever," he said coolly. "Merely until our food and our air-supply give out. Or perhaps our heat."

"Oh!" she cried, dawning terror in her eyes.

Crocker drew her toward him and held her close.

"Now, if I had listened to your grandfather's two orations this evening," he said, grinning, "instead of studying your photograph during the first one, and watching you during the second, I might have some faint idea what this trip is all about."

Iralene smiled up at him through a single tear.

"You really—" she began.

"Yes," he said quietly. Their eyes met, then locked. Gently he released her. "Well, now it's up to me to try and get us out of this mess."

The two of them stared around the little cabin of the space ship.

"Here's a note for us," the girl announced, picking up a sheaf of neatly typewritten pages from the hanging central table.

SIDE by side, they sat down on one of the berths and studied the note. It read:

My dear Iralene and Ben Crocker:

I am sending the two of you out into space, in order that science may be advanced. There is no risk, or I would not send a person whom I love as much as I do Iralene. I would go myself, were it not that my leg might hamper me, and anyone who accompanied me, on a strange planet. Your speed will be so many times that of light that you will span a distance of ten light-years in about twenty-three hours.

Those twenty-three hours will give you scant time in which to master the controls of your ship. But do not fear. Everything is provided for. Food, water, heat, light and power. Full directions for steering the ship, if you should happen to get slightly off your course. Means for landing gently. Means for your return to the earth.

The first matter to consider is charting your course through the skies. I am convinced that, in spite of your changed state of existence, light will look like light. Even so, inasmuch as you will be traveling many times the speed of light, you will be able to see only those stars almost directly ahead. Look through the forward porthole, and pick out 61 Cygni from the accompanying chart—

"Come on," Crocker interrupted. "Let's star-gaze."

They got up from where they were seated on the bunk. But, as they started for the bow, Iralene looked through a porthole on the left side of the ship. A little cry escaped her. "A planet!" she exclaimed, "a planet,

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to the left and a little below us!"

"Impossible!" Crocker replied. "The old fool—I mean, your grandfather said we would be traveling at nearly three thousand times the speed of light. At that rate, we ought to be well outside the Solar System by now. It should be invisible because we are outdistancing its rays."

Iralene shrugged. "And yet there it is," she retorted.

Crocker peered out of the bow porthole. There, a bit below, hung a dimly illumined half-disc. Its curved edge, lying to the left and slightly downward, was a sharply defined arc, from which several bright splotches extended inward. Its straight edge was dim and indistinct.

"It must be the earth," he asserted, thinking aloud. "Those bright splotches could be Australia, and the edge of Asia and Alaska, I'd judge."

Iralene joined him, and with heads close together at the porthole they watched the earth gradually shrink and recede, shift downward and to the left.

Finally Crocker ran a hand through his sandy hair.

"I don't quite get it," he asserted. "This space ship was headed east, and yet here we are, way to the west of America. We must be traveling backward."

Iralene laughed.

"It doesn't take all your complicated reasoning to figure that out," she said. "The earth is ahead of us, and rapidly receding; therefore it's obvious we're going backward."

"And not so very fast at that," Crocker added. He took out a pencil, and held it at arm's length, like an artist measuring a landscape; then glanced at the watch on his left wrist.

"What on earth are you doing?" the girl asked.

"Trying to figure out how fast we are going," he replied. "If you want to help, get out a ruler or something and measure the distance from the tip of this pencil to my thumbnail, and the distance from the pencil to my eye." She found a tape-measure, and did so. "Now see if the library, which your grandfather so kindly provided for us, includes an atlas and trig-book."

ABOUT ten minutes later, he commented, "Half size now." Returning to the table, he took a pad of paper, and sat down on the right hand bunk. Iralene seated herself on the left hand bunk, across the table from him, and watched him, chin on palms and elbows on table, as he busied himself with mathematical calculations.

A half hour later Crocker announced that they were speeding away from earth at the rate of five hundred thousand miles per hour!

"So what?" asked Iralene.

"So this! That old id—I mean, your grandfather told me that the spot on the earth where his laboratory is located was moving through space at about 244,000 miles per hour. We are moving backward away from the earth at about twice that speed, which means that for some reason we are just about doubling the effect of being left behind!"

"I don't believe it! I can't believe it! Grandfather can't be wrong in his calculations."

"He can't, eh?" Crocker snapped, and shrugged his broad shoulders. "You remind me of the lawyer, who told his client over the telephone, 'They can't put you in jail for that.' You remember the client's reply? 'I'm phoning from the jail.'"

"Then why are we sitting here arguing—wasting time?" the girl asked nervously. "We have less than twenty-three hours in which to find out what to do when we reach our destination. Why don't you do something?"

A tolerant smile spread over Crocker's face. It maddened the girl.

"At only five hundred thousand miles an hour, we won't get anywhere very fast," he pointed out. "So let's calm down and take our time. Suppose you check up on our domestic arrangements, while I read the rest of his letter and try and figure out where he made his mistake, and where we are really headed."

"I don't believe he made any mis-

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take!" she protested. "Grandfather couldn't—"

Crocker gripped her by the arm until his knuckles went white.

"Now look here," he interrupted. "We may be cooped up together in this one little spindle-shaped room for months—perhaps for life—and not such a long life at that. I'm going to do my damnedest to try and figure how to run this craft. Or, if you know more math than I do, I'll do the housework, and let you handle the books. But, in the meantime, let's both try to be friends. I'll do my part by trying not to tell you too often what I think of the old fool who got us into this fix."

Iralene's blue eyes flashed again at this last remark; then she heaved a deep sigh, her shoulders slumped, and all the fire went out of her.

"All right, Einstein, you win," she sighed. "I'll play house."

Crocker laughed.

"I'm not so hot, myself," he confessed. "Not much opportunity to heave a forward pass out here in space." He paused. "Well, it's late at night and we've had a nerve-wracking experience. We ought to get some sleep in on our borrowed time."

"But what about the twenty-three hours?"

"That's out! We're not headed for 61 Cygni. We're not traveling faster than light. And we are still within the Solar System. It's now almost morning, Earth-time. A good sleep will clear our heads. Six or eight hours from now we may have traveled far enough so that we can figure out just where we're headed."

Iralene began rummaging in the various cupboards. Crocker, still seated, ran his fingers through his tousled sandy hair, and resumed the reading of the letter from the professor. Once Iralene made him move to sit on the opposite bunk, but he scarcely noticed, so engrossed was he in the message. Finally he reached the end of the letter. He looked up.

"Well?" asked the girl, smiling down at him.

"It's all here," he replied. "Full directions how to regulate the heat, how to reoxidize our air, how to redistill our waste water, and even how to steer this old tub. There is water, food and fuel enough for nearly a year. Your grandfather certainly didn't overlook anything!"

"I rather thought you'd eventually come to appreciate him. I knew he wouldn't have sent us off into space unless he had made every necessary provision for our safety. Well, our bunks are ready. Good night, and happy landings."

She sat down on the bunk across from Crocker, swung her trim legs up onto the mattress and drew the curtains closed.

Crocker did the same in his. He stared out for a moment at the sun, still hanging low to one side. Then he drew a shutter across the porthole, undressed, and crawled between the sheets. He was still pondering the contents of the professor's letter as he dozed off to sleep.

CHAPTER III

Lost

CROCKER awoke with a start. For a few moments he couldn't quite recollect where he was. Then, as his predicament dawned upon him, his heart began to race. Taking a firm grip on himself, he slid open the shutter of his porthole, and peered out.

His eyes met jet black darkness, peppered with stars. No sun. Hurriedly he pulled on his clothes, and swung out of the bunk. Iralene's curtains were still drawn.

He now noticed that the sun was streaming in through the overhead portholes, at quite a slant from the right. He glanced at his wrist-watch: twelve o'clock noon. Then he hurried to the bow porthole, and peered out—but no sign of the earth. It had disappeared completely.

"After we had been out about twenty minutes," he mused aloud, "the earth seemed about one and three-quarters inches high at arm's length.

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If it halved its size each time the time doubled—" He glanced at his wrist-watch again. —"We've been traveling for twelve hours. The earth should be now a little less than one thirty-second its size—about a twentieth of an inch. It still ought to be visible."

Some instinct caused him to pace to the rear of the space ship and peer out. There, in the black sky, hung a tiny half disc. It was too small for him to distinguish any of its continents; yet it must be the earth, for it was too large to be any star or planet. At one side of the earth, an inch and a half away, was a bright dot; it must be the moon.

Suddenly Crocker gave a glad shout. Iralene poked her head out from between the curtains of her bunk.

"Why the glee?" she asked sleepily.

"We're headed back! We must be!" Crocker exclaimed. "We started out backward, with the receding earth seen through our front porthole. Now the earth is behind us. If we are still backing, we must be returning toward it."

Iralene withdrew her head, dressed hurriedly, and joined him. Hand in hand, and with new hope in their hearts, they stared out across space at the distant planet, from which they had departed twelve hours ago.

Finally Iralene disengaged her fingers from his.

"I'll tell you what we can do to celebrate," she announced. "Let's have some breakfast."

The girl busied herself at the electric stove and soon they sat down to a steaming meal of scrambled eggs and coffee. Little was said during the meal, but Crocker eyed the girl with unconcealed approval.

After they had washed and put away the dishes, they again stared out through the stern porthole at the distant earth.

"The earth has moved!" Crocker exclaimed. "Or, rather, we're no longer headed exactly toward it. It is higher and further to the left than it was before breakfast. Come on! We've got to steer the ship!"

"How?"

"Your grandfather's letter tells how." He fished it out of his pocket, turned the leaves, and then read:

> Inasmuch as one of your space-dimensions has been interchanged with time, a lateral distortion of your ship in any direction will result in accelerating the ship in that direction, thereby changing its course. The steering-wheels in the bow accomplish this distortion. Use them as though they were ordinary steering-wheels.

"Come on," said Iralene. "There's no time to waste!"

THE steering-wheels were clearly marked: one "Up" and "Down"; the other "Right" and "Left." Together they swung the two wheels to the right and down. A series of clicks, then the purr of motors. The framework of the space ship creaked and strained.

Further and further they turned the wheels, until both wheels reached a notch marked "Danger." The distant speck of light which was the earth, in the black void of space, continued to mount higher and to the left.

"Further! Further!" cried the girl in panic. She tried to wrench the wheels past the stops.

But Crocker ripped her hands away. The two wheels spun back to neutral.

"Do you want to wreck us?" he cried harshly.

With a gasp, she flung herself upon him—tried to reach the wheels—beat upon him with her fists. But flinging his strong arms around her, he held her tightly until she went limp in his arms.

"There, there, dear," he soothed, as he led her to one of the bunks, and forced her to sit down. "Getting panicky won't help any. And we ought to know better than to try to steer this boat. Something fundamental went haywire with your grandfather's calculations. Space and time have *not* been interchanged—we ought to know that, from the fact that we are *not* hurtling toward 61 Cygni as planned—and so everything else that depends on the swapping of space and time is all wrong too."

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He seated himself beside her, and placed one arm across her shoulders.

"But Grandfather couldn't—" Iralene began.

"Skip it!" he snapped.

She stiffened momentarily, then relaxed, and leaned against him. Looking up into his face, she murmured hopefully, "You called me 'dear' a moment ago, Ben."

He clasped her to him, and kissed her firmly on the lips.

When he finally released her, she drew away, a frown on her face.

"Well, that's that. What are we going to do about it?" she asked.

"About the steering? We can't—" he evaded deliberately.

"No, silly. About us."

"Nothing," he said. "Until I get out of this mess, I've no right—Iralene, sweet, we've a long life ahead of us, *if* we can get back to the earth. Let's hope for that."

He leaned over, and kissed her gently on the cheek. Then he spread the professor's letter out on the table, and fell to studying it. The girl watched him for a few moments, then got up quietly, and busied herself about the stove. From time to time, Crocker would arise and stare out of the various portholes at the star-dotted blackness which surrounded them.

"I think that I have it, Iralene," he said finally. "Our ship is still moving away from the earth, and is tumbling over and over in space, in a sort of screw motion. Decidedly screwy, in fact." He grinned wryly. "I've figured out roughly that our ship is revolving around an axis, running through the upper left side and lower right side of the ship. When we were on your grandfather's roof, such an axis would have been parallel to the polar axis of the earth. But now we are rotating just the wrong way around. Something has sent us spinning backward through space, with the same speed as the earth's, but with exactly the reverse motion. I intend to find out what."

BENSON CROCKER continued his calculations and his star-observations. Iralene put the ship on a regular domestic schedule, and attended to the housework. In addition she regulated the heating and lighting, redistilled the wastes. And gradually she learned to help her companion with his astronomical observations, and with the simpler of his calculations.

By the end of a week he had definitely confirmed the fact that, like a little planet, their ship was rotating about a fixed axis, one revolution every twenty-four hours. The distant earth gradually shrank, until it be-

[Turn Page]

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came merely one more star in the black void. But still Crocker could think of no explanation for these phenomena.

It was Iralene who finally suggested that the solution must lie in the "minimal lines" about which her grandfather has discoursed so learnedly on the evening of their departure into space.

They delved through all of the books in the ship's library, and marked and read every reference to the subject—especially pamphlet copies of papers by Eddington and Birkhoff on relativity, and Professor Porter's own monograph in which he had elaborated on Eddington's theory.

They learned that a minimal line is an imaginary conception of pure mathematicians—a line of a sort which could never exist in real space, in other words an equation of analytic geometry ($y = ix$, in which i is the square root of minus one), having supposedly no meaning in actual reality.

But Eddington had shown that this was the true equation of a ray of light in four-dimensional space-time: $s = it$, in which s is the distance in light-years, measured along the ray, and t is the time in years.

A minimal line has zero length; therefore Eddington had shown that the source of a ray of light, and the eye which perceives it, touch each other; and hence no ether or other medium is needed for its transmission. A minimal line is at right angles to itself at every point on it; therefore Porter had shown that the pulse theory of light and the wave theory of light were identical.

And Porter had proved one more point, which his granddaughter and Ben Crocker vaguely remembered having heard him mention, namely that, by proper choice of one's units of space and time, the path not only of a ray of light, but of *every* object through space-time, is a minimal line.

"So what?" asked Iralene. And there the matter rested.

But one day, as Crocker was aimlessly toying with the fascinating little equation, $s = it$, it suddenly occurred to him to interchange space and time in that equation. The result was $t = is$. Multiplied through by i, the answer was $it = s$. That was the original equation back again with space negative! It meant going backward along one's world line in space-time!

"Iralene," he shouted. "I've got it!"

She came running, and he showed her the simple transformation which he had worked out.

"We are merely back-tracking over the earth's orbit, following the path through space formerly traced by New York. It is now June 22—"

"June 22!" she exclaimed. "Your Class Day. Oh, what a pity. Were you taking a girl?"

He shook his head, and grinned.

"No."

"I'm glad. But it's too bad you can't be there. You were to have been one of the Class Marshals, weren't you?"

He nodded.

"The football captain usually is," he explained. "But it really doesn't matter. I'd much rather be here with you. That is to say, I'd rather be with you. I'll take you to next Class Day, to make up for it. I guess they'll have to mail me my diploma."

"But will there be any next Class Day? I mean—"

"Yes," he asserted happily. "For, as I was about to announce when we got off on this tangent about my missing my graduation, all we've got to do is wait for December, and then meet up with the earth on the other side of its orbit. Kiss me, dear. I may become a mathematical physicist some day, after all."

"That's a fine reason for kissing a girl," she retorted, holding up her lips dutifully.

CHAPTER IV

The Galactic Drift

THE next few days were a joyous relief to the young couple marooned in space. Their hours of fe-

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verish study and computation were over. They had figured out that they were safe. All that remained for them now was to wait for a little more than five months, and then effect a gentle landing on the earth. All seemed well.

But two people, no matter how congenial, cooped up together in one small room, must eventually get on each other's nerves. Crocker began to worry about the supply of food, heat and water. According to calculations which he made, the supply might not last until December. When Crocker announced a schedule of rationing, Iralene cried that she was hungry, and cold, and thirsty. On the question of thirst, Crocker suggested that she be more careful with the redistillation. They quarreled, and she refused to speak to him for the rest of the day.

The next morning both of them apologized, and for a day or two they were even closer to each other. But the hurt rankled just below the surface, threatening to break out again at the slightest provocation. So passed a series of days of alternate idyllic bliss and petty quarrels.

Finally, about a month after they had been launched into space from the roof of Professor Porter's laboratory, Crocker was moodily staring out of a porthole during one of their spats, when he suddenly noticed that not only the earth, but also the sun, seemed to be falling behind!

This was not readily evident, and was due to the fact that at midnight the front of the ship was pointed toward the receding earth, with the sun slightly below abreast of the left side of the ship; whereas at noon the rear of the ship was pointed toward the earth, with the sun almost overhead.

Crocker worried a good deal about this new discovery of his. Each noon and midnight he made a pencil mark on the table, to indicate where the shadow of the edge of a porthole fell, and noted that the noon mark moved steadily forward, whereas the midnight mark moved steadily aft.

His worried condition kept him from quarreling. Iralene noticed his preoccupation, and worried about his health. So things went quite peacefully aboard the ship for several days. Then one day the girl caught him making one of his periodic marks on the center table, and demanded an explanation.

"I'm not such a good physicist after all," he groaned. "Here we've been living in a fool's paradise for days! We aren't ever going to see the earth again!"

"Why not?" she asked tremulously.

Crocker laughed grimly.

"As your grandfather said to me once before, 'But you forget the galactic drift, Ben!' Well, that's just what I've done. We are retracing the path of New York through space, all right; but, by the time that we reach December, 1936, and the earth reaches December, 1937, the whole Solar System will have drifted. Let's see." Crocker did some rapid figuring on a piece of paper; then looked up at the girl, face white. "It's even worse than I thought," he said dismally. "We are going to miss the earth by almost exactly fifteen billion miles."

FOR one horror-stricken moment the girl stared down at him. Then, as though in a trance, she moved toward the panel of control-switches. Sensing disaster, Crocker sprang to his feet and thrust himself between the girl and the controls.

"What's the big idea?" he demanded.

"I can't stand it!" she cried. "Going on, day after day, with our supplies gradually petering out, knowing that death is just ahead. I can't face it."

"What do you intend to do?"

"Throw the neutralizing switch. Make space-time normal again." Then, as he started to protest, "Oh, I know that Grandfather's theories are all cockeyed. You've demonstrated it, again and again; but what good have you done with all your proofs? You haven't got us out of here."

"Wait a minute, dear. Let's stop and figure out what will be the effect of putting things back to normal. We may get ourselves into a worse fix."

"We can't be worse off than we now

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are. Anything for a change!"

She lunged forward, tried to crowd past him, to reach the switchboard. He seized her roughly.

"I hate you!" she screamed.

Then suddenly, with a superhuman burst of strength, she threw him off his balance. Before he could recover, she was at the switches. The ship gave a sickening lurch. Iralene flung her arms around his neck.

"Oh, Ben," she cried, "I love you. Forgive me. I don't want to die."

He held her close, stroked her shoulder. They peered out through a nearby porthole.

"Look, Iralene, look!" he cried.

The space ship was resting on its pedestal on the rooftop of Professor Porter's house, just as it had been on that well-remembered night a month ago. Now, as then, it was night. Now, as then, Professor Porter was standing by his bank of switches staring at them out of pale eyes beneath a domed forehead.

"Of course!" Crocker exclaimed. "The neutralizing field has completely neutralized the effect of the other field. We are back to normal. Come on, dear."

Turning the door-knob he opened the door and led the girl out through the maze of wires to where her grandfather stood.

The old man's face fell as they approached him.

"It failed! My great invention failed!" he cried.

"What do you mean?" Crocker asked.

"I closed the switch, and nothing happened. And then out you step. Did you throw the neutralizing switch?"

"I'm just beginning to get it," said Crocker levelly. "Professor Porter, your granddaughter and I have been traveling through space for a month. Then she threw the neutralizing switch, and here we are back to normal—normal *time* as well as normal *space:* the same instant, as well as the same place, from which we started a month ago.

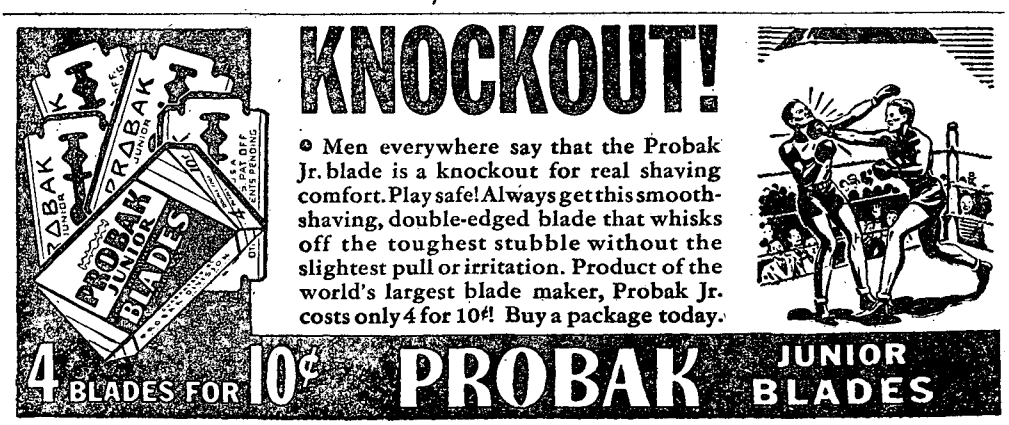
"We really ought to have expected it from the behavior of that second little model which you showed us—if you can remember back that far, sir."

"Back that far? Oh, yes, I understand. It was a month ago for you, although only a minute for me. Well, we have a lot of figuring to do; but that can wait. Tell me about yourselves. Are you both well?"

"Well—and happy," Crocker replied, putting his hand in Iralene's. "And I guess I'm the fastest worker on record. I proposed to Iralene less than a minute after I met her!"

"Your math's still wrong," commented Professor Porter dryly. "43,200 minutes!"

Next Issue: LIFE ETERNAL, a Complete Novelette of Solar Secrets by EANDO BINDER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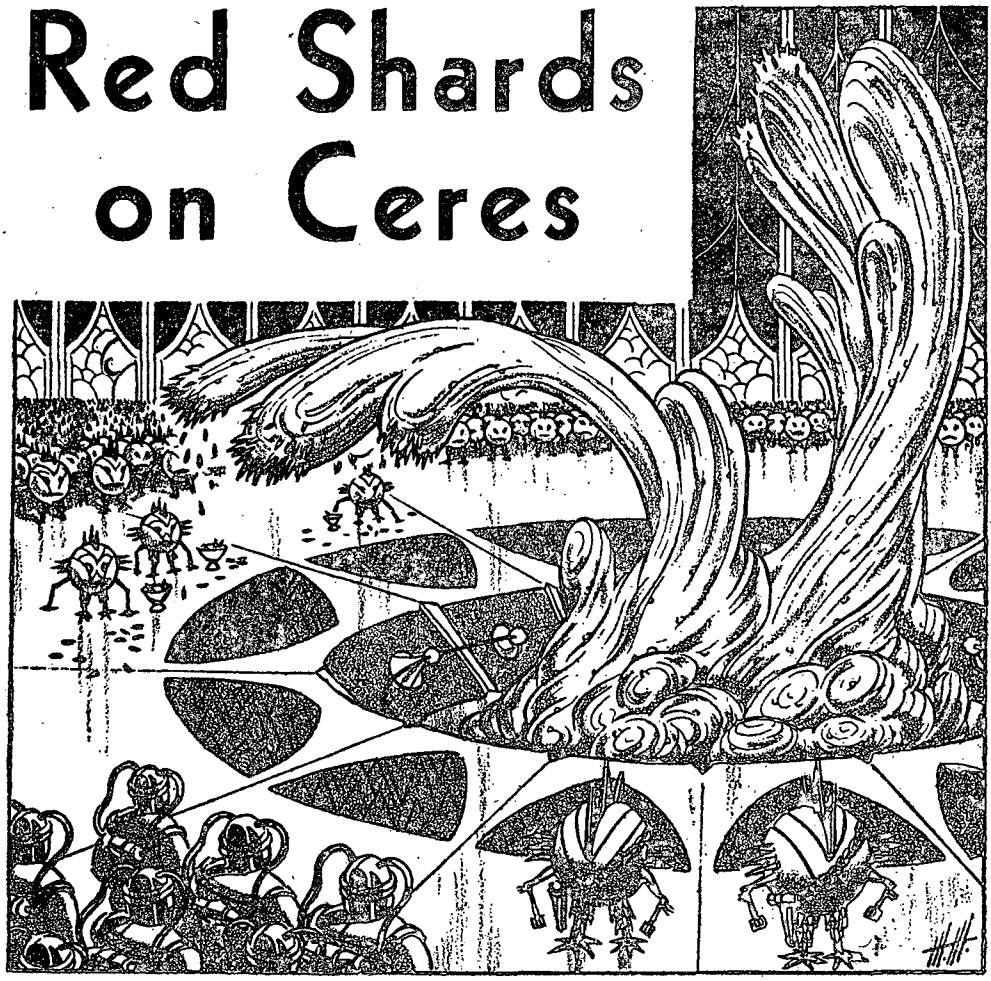
Red Shards on Ceres



The ghoulish mass thrust up hungry pseudopods

They Seemed Harmless Enough, These Broken Pieces of Glass on a Deserted Asteroid—But Strange, Crimson Menace Glowed in Them!

By RAYMOND Z. GALLUN

Author of "Old Faithful," "Saturn's Ringmaster," etc.

THAT it was Ronnie Iverness who found the devilish Red Shards was a trick of chance. He was not even a legitimate member of the Farnsworth Expedition to airless Ceres. He was just a freckle-faced twelve-year-old with nerve enough to stow away on their ship, the *Antares*. Dave Iverness, the pilot, happened to be his brother.

Ronnie was dragged out of his hiding place two days after the *Antares* left Earth. For the balance of the trip, and for a while after the landing on the asteroid, he was kicked around by the whole outfit.

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Then fortune seemed to smile on the youthful culprit.

"He's a game little imp," Professor Farnsworth said to Dave Iverness, when the two were alone in the specimen room. "Maybe it would be the right thing to ease up on the hazing, and to give him a bit of freedom, eh? So far he hasn't even been out of the ship."

Dave, big and bronzed, chuckled softly.

"Sure," he replied. "Ronnie's taken his medicine like a man, and he's regular. Not a trouble-maker, either. He's just so doggoned interested in space ships and other worlds that he can't help himself sometimes!"

Master Iverness was called from the rocket compartment where Hansen, the engineer, was keeping him needlessly busy polishing metal. Presently, though he was expecting anything but favors, he found himsef provided with a regulation space suit. When his good fortune was explained to him, he was too flabbergasted to say much, but his eyes became very large, indeed.

"G-gosh! Thanks!" was about all he could stammer just then.

The space suit was many sizes too big for him. The vast, bloated legs of the contraption made walking, and even standing, somewhat difficult for the boy, for he found it necessary to keep his feet spread wide apart. But Ronnie was quite willing to undergo physical discomfort for the thrills of exploration.

With Farnsworth's full permission, he left the ship, along with six men, Dave Iverness among them. The group moved off toward the near horizon, and presently entered a jagged gorge that looked like the burrow of an angry Titan. Their purpose now, and in fact the entire purpose of the Farnsworth Expedition, was to collect mineral samples for the Smithsonian Institute.

For five hours the kid was in his glory, while he and his companions bounded and clambered over the rough, mysterious landscape, where shadows were as sharp and black as the fangs of fiends. The massiveness and clumsiness of Ronnie's attire was largely made up for by the fact that the gravity of tiny Ceres was very slight.

Nothing special happened until the sallying band had almost completed their circuitous return to the *Antares*. Then Ronnie noticed something off to his right. It was a cleft in the rusty ground. The other members of the party were straggled out ahead of him now; for he hadn't been able to move quite as fast as they in his ill-fitting space armor.

THE cleft offered no unusual promise. The men had ignored it. Nevertheless, youthful whim sent Ronnie hopping to its brink. Thick gloom enveloped its depths. But close to the torn lip of the cleft there were curious, broken fragments lying in the dust. They were flat and flaky, like pieces of shattered, red glass. As any adult would have done, Ronnie stooped and picked one of them up. Inside the thin, translucent texture of the shard, there slumbered a deep, bloody glow.

Ronnie wanted to yell out about his find to his brother up ahead; but something unfathomable restrained him. No physical circumstance should have prevented him from doing this, for his oxygen helmet, and the oxygen helmets of all the other space suits belonging to the expedition, were equipped with radio receivers and transmitters.

Nevertheless, for some eerie and unknown reason, Ronnie held his tongue. It was as though, somewhere, beyond and yet within himself, a hidden entity was considering the situation cautiously, in an effort to determine the very best way to cope with it, with the least chance of making a mistake.

Master Iverness did not quite realize this at once, however. His own feelings were strange. He stood for a long moment, the red shard clutched in his gloved hand, his brows, his lips, and his freckled nose puckered in vague puzzlement. During that moment a subtle web of intangible but very real power ensnared his facul-

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ties. Ancient Ceres, barren, burnt out, and seemingly lifeless, still harbored magic of which man had no inkling.

Presently Ronnie felt a peculiar tingling sensation in the hand which held the glassy fragment. The sensation warned him that the piece of red mineral was probably not entirely safe to hold onto. But when he decided to drop the thing, he was surprised and frightened to discover that his fingers did not respond to his will!

Just then he heard his brother's voice shouting in his earphones: "Hurry up, Ronnie! Where are you anyway?"

The kid really wanted to answer his brother this time, for he was badly scared. He wanted to forget everything that had just happened, and go bounding over the ridge which now hid his companions and the space ship from view. Words formed in his mind automatically, but there they stayed! They couldn't get past his tongue and vocal cords!

It was the same with his sturdy legs. They refused to obey the commands of his brain! It was as though somebody else had suddenly taken possession of his entire body! And Ronnie, with a youngster's quick intuition, knew that the wicked red shard he clutched and couldn't let go of was somehow responsible.

This knowledge did him no good, however.

Now he spoke, and though the words were undoubtedly copied from his memory in some manner, still he had no wilful part in their utterance. Their tone was cunningly calm.

"Be with you in a minute, Dave," he said into his microphone. "Just wait up for me."

Then, impelled once more by a weird and irresistible impulse which seemed to originate in the substanceless ether surrounding Ceres, he selected more of the shards from the ground about him with his free hand, and stuffed them into the pouch that was part of his equipment.

THOUGH he did not realize it, he now had fourteen of the mysterious fragments, besides the one which he held tightly in his right hand. Perhaps this was just a coincidence; but then again, perhaps, it was not, for there were fourteen men in the Farnsworth Expedition.

Now he proceeded toward the ridge, his movements entirely beyond his control. He crossed the ridge and descended into the little valley where the *Antares* rested. With a cunning not his own he scanned the group of men beside the ship. The entire company—fourteen—was in sight. Those who had not gone afield were busy excavating a shallow pit in the hard crust of Ceres, their purpose being to obtain samples of the minerals beneath the surface.

Ronnie's actions, now that he had an audience, were deceptively normal.

"Hey!" he shouted. "Everybody! I found something!"

The men turned to look at him as he bounded clumsily into their midst.

"What's the matter?" Dave Iverness questioned.

"I've got some red stuff, like pieces of glass!" Ronnie's voice piped. "I found 'em over the ridge. Look!"

He held up the fragment which his right hand clutched in a viselike grip.

Dave Iverness scrutinized his kid brother closely. He saw that the youngster's face was pale behind the glass front of his oxygen helmet; but this might only be the natural result of excitement.

"Let's have a look at the thing," Dave Iverness invited, extending his hand.

"No!" Ronnie's guiding entity replied. "This one's mine! But I've got a lot of other pieces in my pouch. One for everybody. Wait!"

It was a bad moment for Ronnie Iverness. He alone had an idea of what was about to happen; but in spite of his tremendous inner struggle, he could not so much as give a tiny squeak of warning. His will was an impotent nothing imprisoned in a body not his own.

As though he were watching the actions of another person, he saw himself remove the baleful shards from his pouch, and pass them around, one

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to each of his companions, Dave and Professor Farnsworth among them.

What followed was as strange as the dark wisdom that produced it. A subtle spell of unearthly wizardry conquered the men as easily as it had conquered the boy. By the time that each individual knew that all was not well, it was too late. Fingers clutched the shards in grips that no human will could break. The channels between brain and muscle were seemingly severed, and something invisible and intangible assumed complete control.

Nevertheless, the activity of each human brain went on unhampered. Thoughts of fear and dread and wonder were not checked. The men were scientists; this being so, each of them tried to construct a theory which might explain the weird miracle. All of them must have arrived at approximately the same conclusions.

The shards were composed of a material which acted as the receiver for some eerie neuronic control, perhaps propagated through space by a form of etheric impulse. These impulses, when received, acted upon nerve tissue, probably first contacting the nerves of the fingers that held the shards, and traveling thence to the spinal cords and brains of each individual. The strength of the impulses was sufficient to dominate completely the normal neuronic messages by which a man guides the movements of his body.

CLEARLY, what had happened was the work of an intelligent agent with a definite purpose. The red fragents must have been planted beside the cleft in the hope that they would trap unsuspecting space wanderers.

Professor Farnsworth was now the first human marionette to respond to the silent commands of the hidden unknown. While the others waited stiffly, he entered the *Antares* and proceeded to the radio room. There he sent out a call to Earth in code:

Marvelous discovery on Ceres. Organize large expediton and dispatch to Ceres at once. Arnold Farnsworth.

He learned then that not only his body, but his memory as well, was a slave to the unknown. The glassy red fragment he held was not merely a receiver of commands. It could be used to probe his mentality as well. Else the message in English could never have been composed.

He could guess, too, the sinister purpose of the radiogram. More human beings were wanted here on Ceres. As slaves? For food? Only time would tell.

Unable to resist the guiding compulsion that gripped him, he left the *Antares* and joined his company. Then the trek toward some cryptic destination began. In single file the fifteen members of the expedition marched back over the ridge. No one spoke. No one could speak. Minds still could function; but they were as impotent as if sealed in blocks of metal.

The party reached the cleft that Ronnie had discovered. They clambered down into its gloomy shadows. There was a rough-cut tunnel there, leading steeply down toward the bowels of Ceres. They began their descent.

In a matter of minutes complete darkness enveloped them. But presently this was relieved a little by light which luminous lumps of radioactive ore in the walls of the passage emitted.

For weary hours the descent continued. Slight though the gravity of the asteroid was, still the task of clambering down a passage in many places almost vertical, made serious inroads on the energies of the adventurers. Professor Farnsworth felt the effect most, for he was old. Yet he could not stop to rest. The insidious power that had mastered him forced him on as no lash could ever have done.

At last a huge metal door was reached. Ponderously it opened to admit the men. They entered a narrow chamber which must have had the function of an airlock, for in its op-

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posite wall there was a second door, similar to the first, which had now closed.

The second portal swung inward. Brilliant light, like that of the sun, stabbed by as it moved. Automatically the members of the Farnsworth Expedition entered the tremendous cavern beyond it.

Far up toward its roof an incandescent sphere shone brilliantly, giving abundant artificial light to this strange place. The floor of the cavern was covered with odd, luxuriant vegetation, planted in orderly plots. This was farm land, then, buried within the heart of dead Ceres.

And now the men saw what manner of creatures inhabited this artificial world. From out of the shadows of spidery, grotesque trees, loaded with green fruit, came a group of furry, spheroidal monsters with thick legs and delicate, tentacular arms. Their mouths were toothless orifices in their globular bodies. Their eyes, set close to their mouths, were cruel and keen. That intelligence looked out through those orbs could not be questioned.

Each creature wore a harness decorated with fragments of the red substance which had been the undoing of the Earthmen, and odd, pistol-like weapons dangled in holsters fastened to those harnesses.

THE Cereans allowed the Earthmen to advance along the road which led across the cavern floor. Then they fell in behind them, like a military escort.

Finally the huge cave was crossed. A short tunnel was traversed. Now the humans found themselves in a second cavern, smaller than the first. The air throbbed with the smooth vibration of colossal, gleaming engines. Molten metal hissed and cascaded from vast retorts. Cereans were everywhere, engaged in intricate work which only a high order of intelligence could have directed. Each of them wore a harness richly decorated with the mysterious Red Shards.

They glanced briefly at the Earthmen. Their curiosity seemed small; but in their cold, lidless eyes there was a promise of death, or worse.

Ronnie and Dave Iverness walked behind Professor Farnsworth, who was close to the head of the column. Like the rest of the group, they could not converse, they could not even turn their eyes to look at each other. Their muscles could only do what the guiding force that held them prisoner directed.

But their minds worked unhampered. Dave Iverness was still trying to devise some plan for escape, though he could see how hopeless their position was. Even if the spell which had enslaved them could be broken, there were still the Cereans.

Ronnie was scared. What had happened was his fault, he was sure. If he had not found the shards, all would have been well. But this feeling of responsibility must have sharpened his wits. The kid was made of that kind of stuff.

Professor Farnsworth felt weak and faint after the exertion of the long descent. Specks of color flitted before his gaze. But the scientist in him persisted in trying to understand the inexplicable. He was still observing keenly everything that passed within his line of vision.

The party traversed the cave of machines, and entered a third cavern, smaller than the others, but still of gigantic size. It was thronged with hundreds of Cereans facing its center in ranks arranged like the spokes of a wheel. There was no artificial light here—only a sullen, reddish glow originating from something in an open space at the center of the packed ranks of monsters.

Slowly, down an open lane, the Terrestrials were forced to approach the thing. Then they saw what it was—some hellish form of life. It grew in a bowl-like hollow in the floor. It seemed at first glance to be only a semi-liquid mass of phosphorescent pulp. But then one saw the countless fine, nervelike filaments that traversed it in every direction, and the glowing nuclei of the myriad, oversized cells that composed it. The effect of a

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close scrutiny was disturbing. Presently and inevitably one realized that here in this mass of alien protoplasm resided deific wisdom, and an intellect that never wearied.

The ghoulish pulp heaved and moved suggestively, thrusting up hungry pseudopods. From the latter, translucent, reddish flakes broke away and dropped to the floor around the pit. These were the Red Shards. They were a natural product of the devilish thing, perhaps originally exuded as a liquid, from its substance, just as a mollusc exudes the liquid which hardens to form its shell.

A number of Cereans were around the pit. Some were gathering the shards in metal baskets. Others, stripped of all their ornaments except a sort of belt made of interlocking shard fragments, stood in line, waiting to perform what seemed a fanatical act of devotion to their hideous god.

ONE by one they were easing themselves gently into the pit whose glowing, pulpy contents folded over them, and began to absorb their still-living flesh.

And now the Earthmen could begin to guess their own fate. With cool deliberation, their hands went to work removing their space armor, clothing, and other equipment. The air around them, now, was cool and fresh. They too were to be food for the monster—a strange delicacy which it longed to taste!

A man named Rogers was the first victim. Still retaining his grip on the red, glassy fragment that Ronnie Iverness had given him, he lowered himself into the pit with the same outward calm that the Cereans were showing. He moved very slowly, as if to avoid injuring the abhorrent mass of jelly that craved his flesh. Pseudopods enveloped him, and he sank into the mass of glowing cells. His body writhed a little, and then was still. Its substance began to dwinde.

Hansen, the engineer, was next. . . .

Behind him, just ahead of Ronnie, was Professor Farnsworth. The sickening experience of watching the ends of two of his loyal henchmen had done almost as much to reduce the stamina of his old body as the exertion of the descent into this realm of horror. He knew that he was going to swoon before his limbs could carry him into the slimy clutches of the monster; and at last he thought he understood the strange and ghastly mystery of Ceres.

He took one more step toward the pit. Then his knees buckled. He could no longer respond to the commands of whatever it was that controlled him. Blackness closed in around him. His ears were roaring. As he fell, he stumbled against the small figure of Ronnie Iverness, close behind him. The weird crystal of evil was knocked from his numbed hand. The boy and the savant sprawled together.

For a fleeting fragment of time, while a dim shred of consciousness still remained to him, Professor Farnsworth was once more his own master. And he acted quickly and surely. With stiff fingers he groped for Ronnie's right hand and struck it a fierce blow. A second shard of evil went skittering and tinkling across the floor.

Then with a final, tremendous effort the old scientist rasped out instructions: "Throw something at that—devil. Something heavy. Kill—it—Get the—the fragment away from—Dave—"

The savant lapsed into limp unconsciousness. But a quick young body was free, now, to act under the direction of a quick young mind. Ronnie no longer held the glassy fragment, and temporarily at least his slavery was at an end. Cereans were rushing toward him, but for the moment he was free.

His gaze fell on a discarded space suit. Here at the heart of Ceres its weight was very small, but its large mass remained unchanged. He seized it, hoisted it easily above his head, and threw it with all his might.

It landed in the center of the slimy

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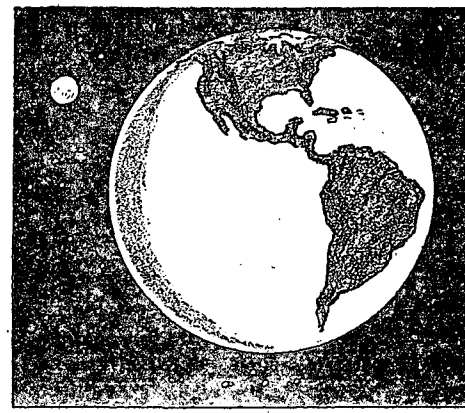
mass that filled the pit. The effect was something like that of hurling a heavy stone into soft mud. The hard metal of the armor was not like the soft living flesh of the victims, and it was hurled with considerable force. The monstrous thing in the pit heaved and throbbed with the shock of pain.

THEN Ronnie darted toward his brother. No one hindered him. The Cereans who were leaping in his direction stopped in their tracks. The furry bodies swayed. Many of them crumpled to the floor, and writhed and kicked aimlessly there.

There were no weapons among the Earthmen, but Dave rushed to one of the fallen natives and jerked from its harness the pistol-like device with which it was armed. Sensing that the ghoulish horror would quickly recover from the shock of the missiles, he directed the muzzle of the weapon toward the pit, and pressed the button which was evidently the trigger.

WHAT IS YOUR SCIENCE KNOWLEDGE?

Test Yourself by This Questionnaire



1—How many light years away from the earth is the star, 61 Cygni?
2—What is symbiosis?
3—Will hydrogen and oxygen combine in the total absence of water?
4—Who is Ouspensky, and why is he known?
5—Is three-dimensional space infinite?
6—What is a minimal line?
7—How light a liquid is liquid hydrogen?

(A Guide to the Answers Will Be Found on Page 64)

other natives stood like grotesque statues, seemingly too surprised to act. But it was not surprise which held them spellbound; it was something far more bizarre.

Ronnie kicked the shard from his brother's hand. At once Dave went into action. A second space suit went crashing into the pulpy mass of glowing jelly. The elder Iverness was a powerful man.

This time the effect on the Cereans was more definite. Their hideous,

A sheet of killing flame leaped forth. Dave did not release pressure on the trigger until all of the slimy thing was blasted and seared into nothingness. A reeking, steamy vapor filled the cavern.

Panting, Dave looked about. A little light was afforded by the now incandescent stone at the bottom of the pit. The Cereans all lay inert except for feeble, pointless twitchings. The Earthmen regained control of their bodies, discarding the Red Shards.

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"That, somehow, seems to be that," Iverness commented with a puzzled grimace. "Good work, Ronnie!"

Several minutes later, under the ministrations of his henchmen, Professor Farnsworth regained his senses. He looked about, and then smiled in wan satisfaction.

"I think none of our alien friends are in a position to cause us any more trouble," he said.

"How so?" someone asked.

"You all saw that each of them is wearing fragments of the red, glassy substance," the savant replied. "Even those about to sacrifice themselves retained a string of the pieces. This gave me a clue. Those fragments afforded a means of contact between the ruling entity of Ceres, and his subjects. They were the detectors for his commands, which were emanated from his substance in the form of a kind of etheric impulse or wave.

"Symbiosis—that was what it was: A state in which two diverse forms of life exist together, usually to each other's mutual benefit. The relationship of the ants, and the aphids, or plant lice, of Earth, is an example. The ants care for the aphids much as human beings care for and protect domestic animals. In return the aphids exude a sweet juice which the ants like; thus both kinds of insect are benefited.

"The thing in the pit was not just a huge, senseless mass of jelly, of which the Cereans made a god. It was the brains of the whole system! The more manlike creatures were controlled by it just as it controlled us—through the agency of the red flakes which it produced. Without the master's guidance, they are inert, as you see. They have not enough intellect of their own to remain on their feet. The ruling entity saw through their eyes, and worked with their tentacles, inventing and building marvelous machines. Now that the entity is dead they will starve, for they have not the sense to feed themselves.

"BARRING violence, the master of Ceres was probably immortal; for, in spite of his wisdom, he had no complex organs to wear out. A few cells in his structure would die, but they would be replaced by the splitting of other cells.

"The entity was very old, and probably had seen much in his time. He and the lesser Cereans must have evolved on another greater planet, where their symbiotic relationship began, for Ceres is too small to have produced a native life of its own. Its gravity is too slight to retain external atmosphere and water. Perhaps that greater planet was destroyed by an explosion. Perhaps thus the asteroids were formed. If this is true, the entity's science was already far advanced; he built this comfortable underworld. That, I think, is about as far as human guesswork can go."

There was a moment of silence after the Professor finished. Ronnie broke it.

"The Cereans in the other caverns—they won't bother us either?"

"I'm sure they won't, lad," Farnsworth replied.

"Two space suits are gone," the boy persisted pessimistically. "Burned up in the monster's hole!"

"We won't need those suits," the scientist reminded him. "There's still enough to go around. Rogers and Hansen are dead, remember. We'll be able to blast and climb our way out of here, I think."

"Then everything's okay?" Ronnie questioned, casting a scared glance about the shadowy cavern. "I mean—about what I did—finding that red stuff."

"Forget it, Ronnie," the savant laughed. "If I had found the shards I would have done just as you did. Someone would have found them eventually, I'm sure; for we were making a fairly complete survey of the substances that compose Ceres. The result would have been the same, no matter who the discoverer happened to be."

Dave Iverness patted his young brother's shoulder.

"You're a real space man, kid!" he reassured him.

And Ronnie Iverness' freckled face registered a grin of relief.

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Black Swirling Water Swept Her Out of Sight.....

Girl Leaps for Ferryboat and Misses: C. C. C. Rescuers Plunge Among Ice Floes

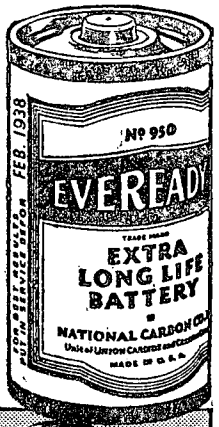
Harold Watson of 64 Scholes St. and his pal Joseph Flanagan of 717 Madison St., Brooklyn, N. Y., who were rewarded with C. C. C. Certificates of Valor signed by President Roosevelt.

"A girl came running down the dock as the boat pulled away. She jumped... and missed," writes Harold Watson, "falling into the icy swirling water. Standing as I was on the deck of the ferryboat with my buddy Joe Flanagan, I saw her swept under the pier while those on the dock couldn't tell where she was.

"One man had a flashlight but he didn't know where to shine it... I had to have it so I jumped back on the dock and dove after the girl with the flashlight in my mouth. I found her easy enough, but it was so cold in there amongst cakes of floating ice I couldn't do more than just hold her up. It looked like we both would drown ... I was ready to give up... when I realized Joe was shouting at me, saw him swimming toward us towing a life preserver. Thanks to him we got the life preserver under the girl and brought her out from under the dock where soldiers in a life boat pulled us out.

"But if it hadn't been for that flashlight and those *fresh* DATED 'Eveready' batteries that kept the light burning in that icy salt water, there couldn't have been any rescue at all, for we never could have found the girl under that dock.

(Signed) Harold Watson



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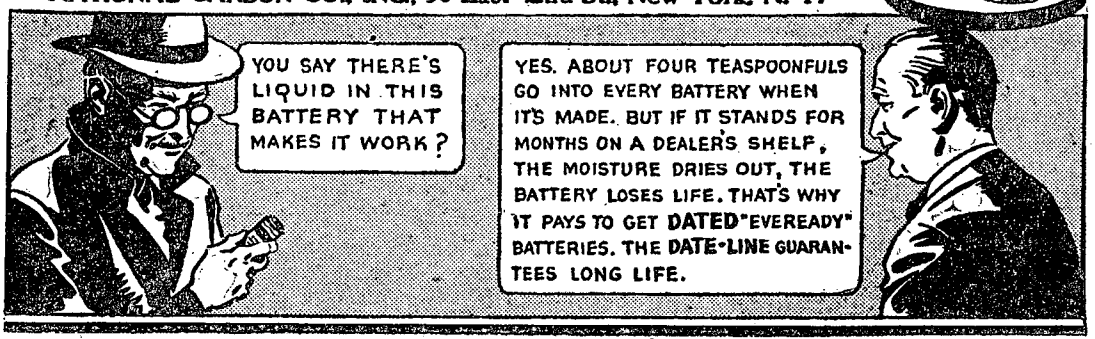
YOU SAY THERE'S LIQUID IN THIS BATTERY THAT MAKES IT WORK?
YES. ABOUT FOUR TEASPOONFULS GO INTO EVERY BATTERY WHEN IT'S MADE. BUT IF IT STANDS FOR MONTHS ON A DEALER'S SHELF, THE MOISTURE DRIES OUT, THE BATTERY LOSES LIFE. THAT'S WHY IT PAYS TO GET DATED "EVEREADY" BATTERIES. THE DATE-LINE GUARANTEES LONG LIFE.

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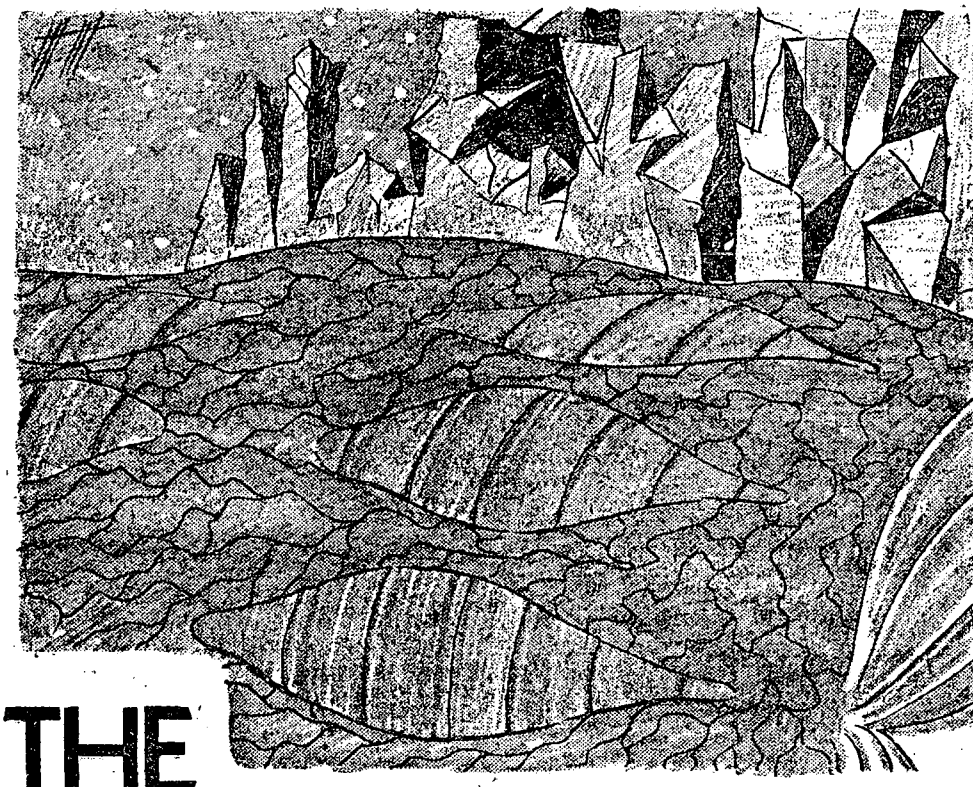

Supernal cold sucked the heat from Penton's body

THE TENTH WORLD

Penton and Blake, Space-Roving Team, Meet Up with the Super-Evolved, Eternal Inhabitants of a Planet More Distant and Colder Than Pluto!

By JOHN W. CAMPBELL, Jr.

Author of "The Immortality Seekers," "The Double Minds," etc.

CHAPTER I

Shleath vs. Pipeline

CAUTIOUSLY, Penton looked around the corner of the building. In the west, Jupiter was setting; here, on Ganymede, complete darkness would come in a few moments.

"No one in sight," he whispered. "For God's sake, don't start concentrating, Blake. Those boys are catching on to telepathy too fast. If they don't hear us, they may telepath us if you think so blasted hard. Hurry up."

Blake hitched his pack into a more comfortable position, and the two set off hurriedly, noiselessly down the broad, deserted avenue. Two blocks they passed silently, to turn down a narrow, rubbish-choked alley. Jupiter's light faded altogether, and they had to pick their way with utmost care. Six blocks they traversed without disturbance—then abruptly a

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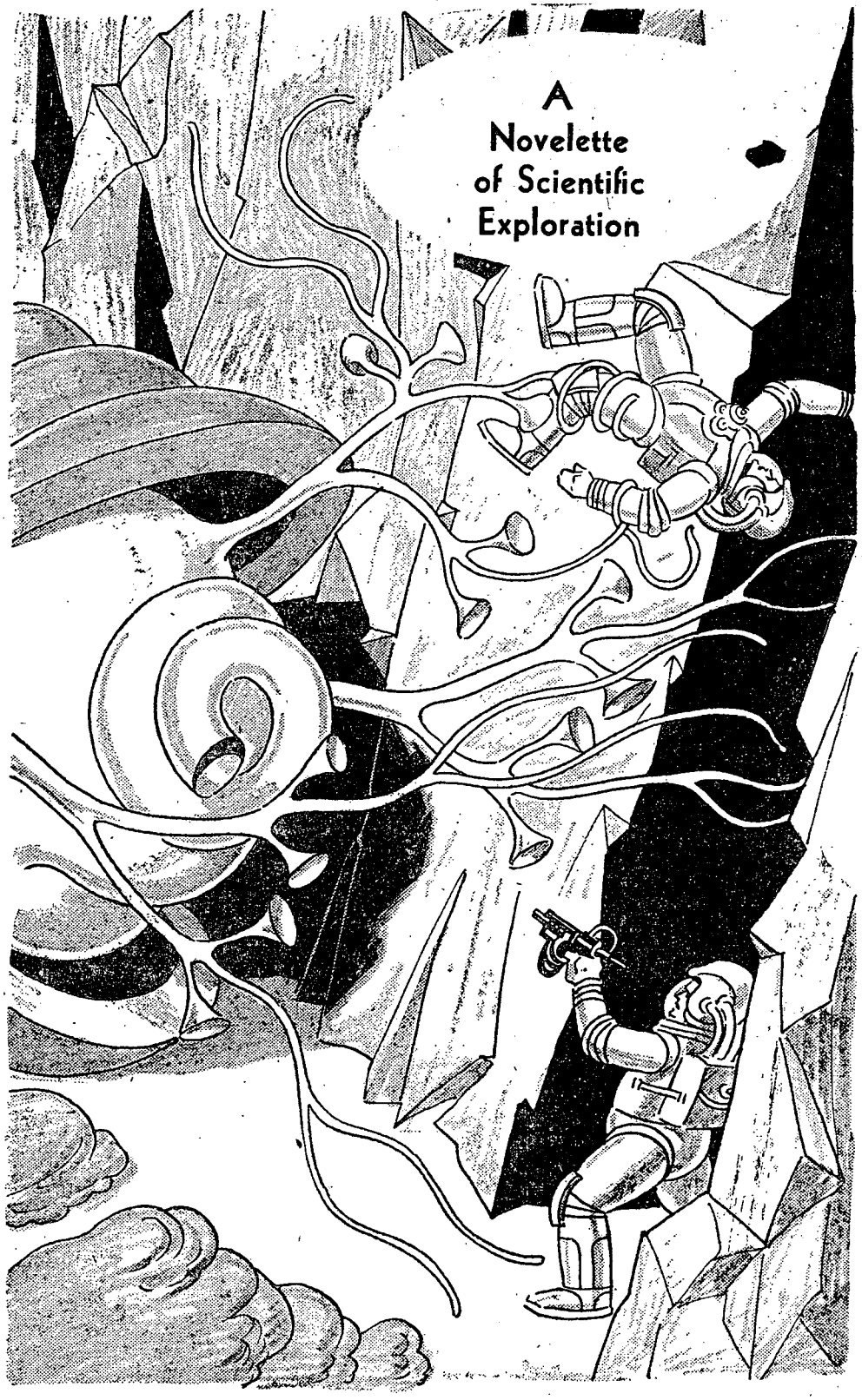

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squeaking flurry of shuffling, running steps darted out from under some rubbish. Dim light reflected from the clouded sky overhead showed a two-foot, glistening mass of evilly furious protoplasm racing down the alley toward them, squealing in helpless fury.

Behind it, silent as death, but with a broad grin of eagerness on its homely face, came a six-legged creature built on the general lines of a dachshund. The protoplasm darted under some rubbish; the six-legged dog clawed after it, the piled boards exploding in a dozen directions, to fall with a furious clatter.

There was a moment of savage squalling, and sodden gulping sounds, while the two men shrank back into protecting shadows. Somewhere a window went up, and a Lanoor's voice shrilled curses into the silence of the night.

THE six-legged animal came out from the mass of rubbish presently, its head high, walking with a slow, rather labored step. Its belly had expanded miraculously, until the six short legs barely held it from the ground. Its keen nose detected the man, and for a moment it sniffed at them briefly, tail wagging, before it went on about its business. Two more of the animals trotted down the alley alertly, paused a moment to watch the first, and turned away disappointed.

"One of Pipeline's innumerable progeny can make more noise chasing down a *shleath*, than any single animal I ever before encountered," Blake said with intent bitterness. "Can we move now, do you think?"

"It isn't the hexapeds, it's the *shleath* that do the squalling." Penton reproved him.

"It wasn't the *shleath's* idea to throw that lumber around. From what I saw, its primary interest was getting under there and staying, very quiet and peaceable."

"Shut up and move. Somebody may come to see if the *shleath* were all eaten, or only part. We have to get out of here while we can—" Penton turned down the next intersecting street; together they dodged through the sleeping city. Half a mile they went, then gradually, as they neared the airport, more life appeared. Ships from cities half around the world, and still in daylight, were active, and the air-force crew had to be up.

"Man, what I'd give for some of those sleep-gas bombs they used on us the first time we landed," sighed Penton. "There's a dozen Civil Guards standing about our space ship."

"You said you'd get through somehow." Blake shrugged. "Get going. It's almost light."

Penton glowered at him, and sat down in the shadow of a low, spreading, bushlike tree. From the knapsack he carried he pulled a number of small metal chips and cuttings, piled them on the sidewalk before him, and added a handful of filings. Then two waxy white cylinders half an inch through and three inches long. He rose to his feet and nodded toward Blake.

"All right, guy, get moving."

A flash of electric current snapped from an atomic flashlight in his hand, touched the metal chips, and they burst into sudden, intense flame. Penton ran hastily into deeper shadows in the direction of the airport. The flare built up to a colossal, intolerable glare; voices over at the airport shouted, and gangling, seven-and-a-half-foot Lanoor Civil Guardsmen were racing toward the strange beacon.

Penton and Blake raced in the opposite direction. Every eye was focused on the weirdly brilliant flare Penton had just made. Windows were clattering open in nearby houses, curious voices calling out. The Earthmen slipped down the side of the huge hangar, rounded a turn, and jumped to their ship. In an instant, Penton had the lock-door open, and was struggling at the inner door.

The combination dial delayed him, slow turns that must be accurate.

"The flare's burned out," Blake said softly. "They—" A sudden new shout went up, and the Civil Guards were streaming back across the field toward them, their arms waving fran-

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tically. From the nearer barracks, a score of Guardsmen burst out, half-dressed and holding up dragging clothes with one hand, blunt weapons waving in the other.

A MONSTROUS eye winked lazily, redly across the field at them, then opened fully in a blinding pencil of light that pinned them like insect specimens on the broad, blue-green turf of the flying field.

The inner door opened as Penton threw a lever. Simultaneously the outer door swung shut on rubber grommets. A score of men shouting outside were suddenly silenced. Penton dived through the widening crack, twisted up the main corridor to the control room.

A moment later the atomic engines *tchked* twice in gentle reproof as relays closed, and began to sing softly of empty spaces. The ship trembled slightly, and when Blake reached the window, a patchwork field was dwindling swiftly below. A dozen, then a score of great beams of light laced across the city, swinging back and forth in slow majesty.

Penton settled back in the pilot seat comfortably, with a deep sigh. He snapped on the automatic controls, and hauled the knapsack off his back.

"Was I mistaken, or did I see Pipeline making a mad dash to join us just before we left?"

Blake chuckled.

"You weren't mistaken, but I guess the borax did the trick. The greedy little hog couldn't leave to follow us until he had eaten it all. But I told you he'd find where we were going."

Penton smiled. "Maybe," he punned, "a hexaped can trail a man by his sense the way a bloodhound trails a man by his scents. They have telepathic power."

Blake looked at him sourly.

"Lousy, if I may say so. Are any planes trying to follow us?"

Penton shook his head.

"Not now. We're about fifty miles up, and going farther rapidly—ah, there's the sun." A burst of light struck through the control window as the space ship shot out of the shadow of Ganymede. "Poor P'holkuun. In some ways it seems like a sort of dirty trick. The poor guy's been sweating for three days over that speech thanking us for exterminating the *shleath*."

Blake groaned.

"'Farewell — come again — we've been glad to see you.' That's all right. But when an orator works himself into a foaming frenzy and calls us the 'saviors of our civilization' and 'the destroyers of the tyrannous Shaloor overloads,' to wind up in a burst of rhetorical glory on 'the greatest, the final blessing, the gift of the hexapeds which have freed us from the terrible menace of the *shleath*'—I quit. Personally, I'll bet P'holkuun was glad to be quit, too. I like that guy, blue-haired beanpole or not, and I'll bet he was no happier trying to prepare that speech than we were trying to work up nerve enough to sit through it. I —hey—we're on the daylight side of Ganymede."

Penton rose a bit in his seat, and looked down through the window thoughtfully.

"So we are. Also, if you observe carefully, getting further toward that side. I'm going to step up to a full Earth-normal acceleration, so grab hold."

The ship was suddenly pulling harder, as the acceleration increased from only slightly more than the equal of Ganymedian gravity to equal Earth's gravitational acceleration.

"My Lord, I'm heavy," Blake grunted. His feet seemed strangely stuck to the floor, and as he walked across the room, his motions were curiously jerky. "Three months on that light world plays hell with your sense of timing.

"But look—we're on the *daylight* side of Ganymede. And Jupiter off there, and there's Callisto and the rest —well, for where are we bound?"

PENTON looked at him for a moment, frowning, then a light seemed to dawn. His expression showed only annoyed disgust.

"For the love of space. Now I get

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it. The Tenth World, of course."

"Which," Blake pointed out, "is outside of Pluto's orbit—further from the Sun. Since we started from the night side of Ganymede, and are now on the day side, we're heading *toward* the sun, not away from it. Or, to bring up an old stickler, was Loshthu a thushol, not a real Martian—"

"In either case he'd be a real Martian, since a thushol is just as truly a Martian animal as is the centaur," Penton pointed out, "but you are just slightly off the track. We are headed toward the sun. Jupiter and the Tenth World are on opposite sides of the sun at the particular moment, if those Martian records weren't wrong, and I haven't made too many slips covering the transformations."

"Oh," said Blake softly. "Did you find out just where and what it was? You didn't tell me much."

"You were too busy playing with the food for the ship. The Martian expedition to Pluto first spotted it—the two planets happened to be nearly in conjunction then, and they have a good orbit calculation. It's in terms of Martian days, hours, minutes, and years, though. I don't know what day, hour and minute it is on Mars. I made rough calculations, and know about where the planet is, which is what we will have to go on. It was never visited, but it's five and two-thirds billions of miles out."

Blake whistled.

"I'm gonna get out my asbestos pants—and not because I am afraid of heat. What will the temperature be?"

"The Martians figured it to be about ten to twelve degrees above zero."

"*Above zero!*" Blake exclaimed. "What is it, radioactive heat, or what?"

"No, solar heat. The zero, however, is zero absolute. Minus which there is no minus, which is why that planet's not minus."

"I like swimming, so maybe an asbestos bathing suit for swimming in liquid hydrogen is called for," Blake grinned.

"You'll need something more than asbestos; you'll need an anti-gravity swimming suit. Liquid hydrogen is so light a liquid that nothing either solid or liquid will float in it, and even some gases would sink."

"Say, I just thought. If it's the far side of the sun we are headed for, how long is it going to take? Half a billion miles from Jupiter's satellites to the sun, and then ten times farther out to Ten."

"Not long. Sixty days or so. We'll be busy, I think, making over the space suits for atomic heating and so forth, checking over the ship, which hasn't had an overhaul since we started out, and so on. Also—"

"At Earth-gravity acceleration, make it in sixty days? When will we stop moving, though?"

"That includes stopping. Thirty days or so accelerating, thirty slowing. If you use Earth-acceleration for thirty days, my lad, you build up a most unholy velocity. If it weren't that we'll be well out in the edges of the Solar System when we hit our top, I wouldn't dare.

"But you go on and take an off-shift now. I'll wake you in eight hours, and you can take over. I want to check my lines and accelerations anyway."

Blake rose with a sigh.

"O.K., Ted. Nothing I can do for you now? Want some coffee—sandwiches—something like that?"

"Thanks, no. Go ahead, sleep."

CHAPTER II

The Tenth Planet

BLAKE looked at the gadget doubtfully.

"Proton projector—so that's what you were trying to do? But what in blazes do you want it for now you have made it? It kicks like a steer."

Penton nodded, ruefully rubbing a sore wrist.

"It isn't quite that bad. I just forgot—it's easy to think a ray-gun won't kick."

"It's a wonder to me that you didn't electrocute yourself. I still don't see

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why you don't wind up with an electron charge that'd be enough to make a lightning bolt say 'please.'"

Blake raised the clumsy-looking weapon, pointed it toward the heavy steel target plate and pressed the discharge button skeptically. The air cleft opened before the mad flight of the protons driven forth, glowing in a path reaching toward the steel plate. Simultaneously the heavy pistonlike weapon kicked back under the drive that shot forth the massive protons at close to 100,000 miles a second.

Abruptly, the steel plate glowed with a hazy, violet light. Ripping static discharges smashed down from it, and the metal hissed like water suddenly touched by a red-hot iron. The steel vaporized into gas, glowing with an intolerable light that faded away gradually.

Blake lowered the weapon.

"Not too bad. Knowing the kick was coming, it didn't bother much more than an extra-heavy .45, but I still don't see the advantage. Half a mile range in air, while the UV pistol doesn't kick, fires continuously, and has a five mile range. The dis gun has a seven mile range, doesn't kick, and allows no argument—anything that tries to argue simply ceases to exist. Why this?"

Penton grinned.

"In about two hours we are going to land on Planet Ten. First men to do so, and we ought to learn a little about its rocks, etc. What strange minerals form at —265° C.? What elements are available?

"Do you remember, my lad, the famous analytical work you pulled on Venus? We'd used up most of our salt, because I forgot to pack that fifty pound bag before we started. And so we were going to collect some on Venus.

"And you announced that the salt of the sea water contained no poisonous elements, but was nearly all sodium chloride. Bright lad. We used some, innocently, and by good luck used it while in the ship. How many hours was it we spent in dreamland? And oh, man, were you utterly soused when you did wake up! Staggered like a run-down gyroscope, talked like a guy who'd lost his false teeth. Sodium chloride, you said. No poisonous elements. And treated us to a quintuple dose of sodium bromide!"

"Well, damn it, bromide and chloride act so darned much alike, I wasn't the first man to get fooled. I said it was only qualitative—answered all those tests—"

"Sure it did. Except it put us in dreamland for thirty-six hours straight. And we wound up with bromide intoxication it took us four days more to get over. It was lucky we had some salt left.

"I'm not blaming you," Penton disclaimed. "I'm just explaining. It wasn't until we tried the spectroscope that we caught on to just what was the matter. As chemists and geologists, we're hams, but, by the gods, we can read a spectrum. You can't analyze with a UV gun because it messes all the lines hopelessly. You can't analyze with a disintegrator, because it doesn't leave anything to analyze. Hence this gadget; the iron vapor it raised just then was swell material for a spectroscope.

"BUT look; this planet's about 15,000 miles in diameter, I believe. We're headed now for the equatorial, the hot zone. It must be all of 5° above absolute zero there. Helium may be a gas, but everything else in the Universe is a solid at that temperature. Suppose you start your breakfast, and my lunch, and I'll finish checking the decelerations. We seem to be heading for an immense plain, which may make landing easier. Did you notice this planet had a moon? It's 1,000,000 miles out, and 2,000 miles in diameter."

Blake turned for the galley as Penton put a few last touches on the proton gun, and put away the tools. Three times while Blake was trying to get the meal, Penton sounded the acceleration change warning, and Blake had to cram things hastily into the non-spilling acceleration con-

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tainers. Once however, he chased a fried egg about the galley with a frying pan for half a minute before a violent acceleration brought it to roost. In bitter silence he removed it from his chest, and opened another into the pan.

Beyond the lock-door lay the utterly bleak surface of the Tenth World. A dim, frozen plain stretched out to a far horizon lost in the pressing darkness of this far, raveling edge of the Solar System. Low in the east, the rising sun was a brighter star, an intolerably brilliant, dimensionless point of light, casting a light that seemed little brighter than moonlight on Earth. But it was bleak, utterly cheerless light. And it was cold, cold.

Barely visible to one side was a lake of clear, sparkling, slightly bluish liquid. Tiny, starlit waves danced and glittered on its surface, moved by some thin, cold wind of this frozen outcast world.

A chill finger from Death's homeland reached into the lock, and Blake shivered violently. He advanced the heat control at his belt.

"Great God, it's cold!" he exclaimed, teeth chattering.

Penton's laughter ticked metallically in his radio transceiver.

"Step out, brother Blake, step out into the breeze. Into the warm sunlight and the bright and warm starlight."

Blake rounded the hull of the ship resting on a smooth patch of sparse, blue sand over black, angular pebbles. There was an end to the plain here. The lake nestled almost at the foot of an immense, chalky cliff that towered into star-lit dimness overhead. Off to the north, a river wound its way slowly, tortuously through a narrow gorge, and vanished, heading, as they knew, to a greater river, part of a yet greater one that emptied finally into a huge, inland sea.

Around the curve of the ship, from the peak of the chalky cliff, a stream of liquid was arching downward, spraying, breaking into flying droplets in the thin air of the frozen world, an air consisting only of helium, and the vapors of this liquid—hydrogen. Nearly a thousand feet it hurled itself down, to smash in glittering foam on broken debris fallen from the huge cliff.

Off to the right, a vein of dark rock shot up at an angle through the cliff, and broke off sharply. A thinner vein of a grey stone lay beneath it. Near the base of the cliff in that direction the tumbled debris lay on the bluish, sandy beach, jumbled, rounded rock, jet black in the light of a five-and-three-quarters-billion-mile distant sun.

THE great cliff stretched off, off to the right for unending distances, lost in the dimness that shrouded forever the far reaches of this dead world.

"Magnificent," sighed Penton, "but not beautiful. Let's go over toward that dark part of the cliff."

Two miles they followed the little lake's shore, then a quarter of a mile down the meandering stream that led from it. The little stream split, and split again in passing a group of tiny islands of the gritty, blue sand, subdivided in a series of streams less than three feet wide. Cautiously Penton tested the solidity of the sandy stuff under his booted foot. Then he stepped across, stepped again, and once more.

"Come ahead, Blake. It's easy enough."

"Catch," called Blake, and heaved the camera across to Penton. He followed Penton's cautious steps. "Hey, what in blazes is this sand? It doesn't feel right." Safely on the other side, he bent to pick up a handful in his thick gloves. Slowly, as he watched, it vanished.

"That," said Penton, "is solid oxygen, I believe. Just what that chalky cliff is, I am not sure, but nitrogen is my guess. Glaciers of it. The sand out across the way is also, I suspect, solid oxygen. The darker rock under it is just plain, ordinary rock."

The black rock glinted under the faint silver light of an immensely distant, heatless sun.

"That light is just strong enough to

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show how bleak this place is. There isn't even snow to cover its bare bones."

Penton nodded.

"It rains quite frequently, I imagine. Rains liquid hydrogen. In the course of ages, that rain has washed all the snow into the rivers and oceans, and now it's piled up in mountain ranges. Like that." His head nodded grotesquely in his transparent helmet, bowing toward the chalky cliff of frozen nitrogen. "I'm going to test that black rock."

Penton set up the camera with Blake's help, then leveled the proton gun and fired at the huge vein of black rock that jutted up. The rock flamed into an inferno of heat, swirled madly in tornadoes of protons, and relapsed into scintillating vapor. Penton pressed the trigger of the camera with a clumsy, gloved finger.

"Now, the greenish-grey—"

"Penton," said Blake faintly, "did you notice those rounded rocks?"

Ted Penton turned his eyes toward his friend.

"Yes, there are hundreds of 'em—all over. I'm going to test—"

"They moved," stated Blake. "I saw 'em."

Penton looked at him thoughtfully.

"You saw shadows. That swirling gas—"

"They," said Blake pointedly, "*are* moving."

Penton looked closely toward one of the ten-foot, irregularly rounded boulders. Very, very slowly it was changing its shape. A dozen near it were changing shape. As they changed, they rolled slowly, irregularly toward the dying glow in the rocky cliff-face.

"Great guns!" gasped Penton. "They—they're *alive!*"

Blake yelled and jumped clumsily under the heavier gravity. Penton turned with leveled proton gun, then lowered it slowly. Blake was heading rapidly toward a narrow, deep crevice in the wall of the cliff, a fault between two immense masses of the solid, black rock. Behind him, rolling very slowly over the spot where he had stood, a ten-foot "boulder" stopped indecisively, changed shape slowly, flattening into stability.

"If you must yell, Rod," said Penton sharply, "disconnect your tranceiver first. They can't move fast enough to catch anything, so come out of hiding."

BLAKE came out of the deep crevice sheepishly. "It startled me, damn it. Hell, it's enough of a shock to see a boulder start walking, but when the darned thing suddenly touches you from behind—"

He stopped, then turned and raced madly for the little series of islands giving access to the far side of the stream and lake, where the ship rested. Penton stared, then followed the direction of Blake's eyes.

From out of the dimness beyond the horizon of the vast plain, *something* was coming. Dozens of Things. No creeping slowness, but a savage, swift motion. Immense Things in incredible action on an impossible world. From dimness that stretched to unseen horizons, they rolled up. Already Blake had fled halfway to the tiny islands that served as stepping stones.

"Blake, stop, you won't make it," he warned. "Come back." Blake's labored running slowed to a halt. Then his instinctive, quick-calculating mind summed up the situation. With equal speed he rejoined Penton.

"From the looks of things, let's head for the crevice there," he panted. "And pray God they go for us instead of the ship."

"We're all right, I think. We can wait on this side of the lake. What in God's name are they—I never saw a vehicle like that before."

The vast Things were slowing down somewhat and came into clearer focus now. Sunlight showed them only vaguely, huge things, a hundred feet long and thirty in diameter, immense cylinders of utter, jet black rolling swiftly across the level plain. Their very blackness made them almost invisible against the dark plain. They were black with the blackness of space itself; an utter, total absorption of every ray of light that struck them.

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The first rolled up, hitching itself strangely to curve its path.

"The ship," said Penton tensely. "They're after the ship. I wonder—" He leveled the proton projector, and pressed the button. A slim, solid line of glowing light lanced out across the tiny lake, and struck the vast thing of blackness. Instantly it recoiled. A spot of furious incandescence boiled on its side, a spot twenty feet across. It quivered into motionlessness.

A strange limpness came over it, and simultaneously the jet blackness left it, replaced by a slate-blue color. It deflated like a balloon just needled, flattening out until one edge touched the lake of hydrogen. The liquid boiled furiously, hissing violently. Clouds of vapor rolled up, to be whipped away by the thin, keen wind.

The second and third and fourth changed their courses and rolled swiftly, not toward the ship, but toward the slate-blue hulk that slumped like a dropped cylinder of putty on the shore. Black bulks squirmed over it, hiding it.

Half a dozen others had arrived. They squirmed vainly for a place beside the dead thing, and rolled on away toward the ship. Penton's proton gun lanced out again, again—five times. Five huge things writhed, then slumped in death, steaming faintly. Others piled on them. Frantically, Blake joined in the slaughter. Scores, hundreds of the beasts rolled up from dimness, sailing madly, blithely into death and destruction. Wildly they piled against the dead bulks of their brothers, hiding the slaty carcasses under heaving, whale-like masses of jet flesh.

PENTON sighed at last and lowered his gun.

"Stop, Blake," he said. "It's useless. There are hundreds more coming and our guns are about exhausted. I get it now. They'll just come from all over that plain. It's heat."

"Heat?"

"They're living animals and they live on it." Penton nodded wearily. Just pray that the ship's up to it. We built her with a powerful frame, and there's only a certain number of those brutes can touch her at once."

"But—why? They're utterly unafraid—"

"They have nothing to be afraid of—or never have had. They don't understand fear. Look. Ten of them on the ship now. Will it take it—"

The huge bulks squirmed and writhed their way over each other, over the ship. Others pushed and squirmed in faintly audible squealings and gruntings, seeking to reach the warm metal sides of the ship.

"Heat," Penton sighed. "They must live on it. They're warm-blooded—boiling-blooded, you might almost say. Somehow, that black hide of theirs is heat-proof while they're alive but releases its heat when they die. Look, they're leaving that first one we killed. It's frozen solid.

CHAPTER III

Mind Over Matter

BLAKE looked thoughtfully toward the huge, shapeless mound that surmounted their little space ship.

"You know, we made that ship strong as blazes. It'll stand an awful strain, but I don't know that it will stand that strain when the metal's been made brittle by this temperature. And—if that ship is broken down—Well, the Martians were the last people even to see this planet, let alone visit it!"

"It won't break," Penton said decisively. "The atomic engines are fueled for about twelve months, and until their power gives out, the currents we established in the walls will prevent it from cooling. That's not what's bothering me, though. What I want to know is how we are going to get in. Just go over and nudge one of those little land whales and say, 'Would you step aside for a moment, sir, while we move in?'"

"We're hot," said Blake, "and I don't mean we're good. If we get anywhere near them, they'll probably

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start trying to cuddle with us. They —"

"Will," said Penton, looking behind him. "They've spotted us."

A half dozen of the bulks stirred uneasily, switching and moving clumsily. Then, broadside on, they started rolling toward the two men on the most direct line—through the lake of liquid hydrogen.

"They'll drown in that," pronounced Blake.

"Or freeze. I—" Penton stopped. The first one had rolled into the liquid, sending it splashing in rainbow showers of ultra-cold. It rolled smoothly on into the lake, going deeper and deeper, until it was fully twenty feet deep in the stuff. Then, it stopped. Blake stared open-mouthed as the huge, blunt end of the vast cylinder of apparently brainless flesh split. As though hinged, an immense, thick flap of black, leathery hide rolled down, and instead of the leathery, featureless cylinder-end, a whole assortment of organs appeared.

First was a tube, fully two feet in diameter, that shot out like an elephant's trunk, to dip into that inconceivably frigid lake. The mobile liquid swirled and bubbled, twisting in vortices. With a tremendous smack, audible in even that thin, chill air, the tube broke contact with the surface of the liquid.

"Drinking," gargled Penton, "drinking liquid hydrogen. By the Nine—Ten Tumbling Worlds! It *drinks* the stuff!"

"Did you," asked Blake softly, "say it would freeze?"

The tube dipped again, another monstrous beast joined the first. Two tremendous smacks resounded, bounced against the cliff behind them, and floated off. The first coiled up its huge, sucking tube again, and rolled blithely out of the lake toward the two men.

Blake ran clumsily, Penton close behind him. The huge cylinder chased down toward them at a speed of fully forty miles an hour, rolling like a mad barrel down hill. Madly, the two explorers raced for the deep, narrow crevice in the cliff wall, dived into it as the whole rocky wall jarred to the impact of the rolling brute.

Penton looked back. The crevice was stopped by a jetty flank, jammed against the rocky wall to a height of thirty feet.

"It can't get in, that's sure," he panted.

The flank retreated, jerking, heaving clumsily. It twisted, turned, scraped and bumped. Another huge cylinder came slamming along and bounced against it. Laboriously the first continued its bouncing movements, now end-on to the crevice. The great, blunt end plugged the tiny crevice that sheltered the men.

Penton grunted.

"ONE at a time, gentlemen, one at a time," he said. "It won't do you any—for—jump!" The black, leathery end split; the coiled, trunk-like member was exposed, also a dozen twenty-foot long tentacular things that whipped out toward them. Penton jumped, Blake before him, back toward the dwindling, narrow end of the crevice. Too slow, the lashing tentacle caught Penton in a thrown noose of leathery strength; an immensely powerful, living rope snapped around his leg, tripped him, and yanked him back.

Jerked through the air helplessly, upside down, he was slammed against the black, wrinkled hide of the huge thing. Instantly, half a dozen tentacles snapped around and against him, forcing him against the black surface.

Supernal, dredging cold sucked the heat from his body. It was a numbing pressure that paralyzed him, forced him into the rubbery, yielding leather of the vast beast. His heat-pack could not offset the awful, unutterable chill of the vast bulk that had pressed him against itself. The blood roared in his ears as he struggled madly to free his arm, to get a chance to try the proton gun.

A flame of intolerable light burst abruptly somewhere near, a wash of momentary heat, gratefully warming. The huge, living ropes contracted spasmodically against him, but as he

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was already nearly buried in the blubbery monster's side, little added strain pressed against him. A vast ripple of muscles somewhere beneath the thick hide tossed him suddenly away from the body.

He stumbled dazedly to his feet. A slate-blue mass loomed near him. The ground beneath his feet was rumbling to the charge of half a dozen monsters rolling down toward the warm carcass. Staggering, the man rounded the flattening, squashing bulk, climbed over a nest of still-twitching ropes, and almost fell into the tiny crevice beyond.

"You're tougher than I thought." Blake grinned at his friend. "For a while I thought you were due for permanent residence here."

The dim light of the crevice faded yet further. A black hulk heaved and moved about on top of the cooling corpse at the mouth of the crevice. Penton looked up at it sadly.

"You might go get a dis gun, if you thought you could run fast, and throw those things out of your way. How were we to expect life here? It isn't reasonable. Damn, brainless, mindless things that can't even be frightened."

"Not," said a very peculiar voice in his ears, "brainless. Merely that we have lost control," it added with a distinct note of sadness.

Blake looked slowly toward Penton. "Did you—"

Penton looked at Blake.

"Please," he asked softly, "don't be that way. You said that—"

"No," said the voice, "I did. I. I'm lying on top of Grugth here—the one you just killed."

Penton crawled farther back into the crevice, and looked back toward the mouth. Very dim against a black sky, the black beast bounced its way awkwardly over the hardening, slate-blue carcass.

"I'm sorry, you know," said the voice, plaintively, "but I can't help it. We evolved too far," it added in explanation.

"I HOPE you hear it, too," said Blake.

"Why? Misery loves company, or do you just want to make sure we're both crazy?" Penton looked unhappily at his friend. "I hear it, and I know I am. It comes right through the radio, and speaks English, which proves it."

"No, not at all. We can't speak by sound here; the air's too thin. On Earth, of course, animals developed sound-signaling. We developed radio, as you call it. I'm sorry if I disturb you. Would you rather I didn't speak? I would like to explain though, that it isn't maliciousness."

"Much," shuddered Blake. "Much rather you didn't speak. I'd rather die sane."

"No," said Penton. "You speak by radio, I can see how that might be, but *how* do you speak English?"

"Perhaps," said the voice apologetically, "Blake could shut off his receiver, if I disturb him. I hear you speaking, you see, and read minds, too, to a certain extent. I can't broadcast telepathy, but I do receive."

The black bulk heaved, and started to move uneasily.

"Oh, I'm sorry. I'm afraid I'm going away. Maybe one of the others will—"

The black wall of blubbery flesh heaved, humped, and rolled rapidly down. It vanished from their sight behind the other. They heard a new voice.

"Grugth," it said, "is cooling rapidly. I'm afraid I shan't be able to stay much longer. I'd like to, of course, but—" The voice faded as another creature rolled leisurely away.

"Are they, or are we nuts? We must be," stated Blake.

"I don't know," Penton replied hopelessly. "They've all gone away. Suppose we try sneaking over toward the ship."

Carefully Penton climbed over the frozen, dead thing. Fully two thousand of the immense things were grouped about the lake. Most of them were working at the bluish sand that circled the little pool. At one end the blunt cylinder had opened, and the familiar two-foot tube was sucking and smacking at the surface of the lake, drinking deep of the frightfully cold

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liquid.

The other end of each had also opened. A great, dark cavern had opened inside the protective outer covering of the blunt end, and a dozen ropy tentacles ending in broad, spatulate tips were busy shoveling the bluish, gritty, solid oxygen into the cavern.

"Maybe," said Penton thoughtfully, "we aren't crazy. I can *see* that, and that's no more possible than a brainless hulk like that learning English in about five minutes. It's eating solid oxygen at one end as fast as it can go, and drinking liquid hydrogen at the other, and with lamentable table manners, too. And except for those doing the same, or playing cuddle-pup with our ship, the whole blasted gang is lying out there sunning themselves in that ultra-dilute sunlight. They're all hanging around the ship, though."

"Sorry," interrupted a soft, slightly accented voice, "I'm afraid I'm coming. You'd better get back in the crevice.

TED PENTON looked and jumped. For all their immense bulk, their softness permitted them to move absolutely soundlessly. A hundred feet away, and coming rapidly, a huge bulk rolled along the cliff toward them. Together the two men jumped back into the cliff. The ground jarred to the impact of the thing as it smashed against the rock. By momentum it mounted its frozen brother.

"Ah," it remarked pleasantly, "I think I am going to stay—yes, yes, I am. But you had better move back a bit to safety." The thing was heaving and bouncing with an incredible awkwardness, trying to turn end on. "Apparently I am going to turn with my tentacles to reach you. If you will get well back, though, you'll be all right. There, I'm sure I'll stay a long time. This is fine."

The thing turned. Awkwardly, heavily, but it turned. Long, ropy tentacles reached vainly as the two men retreated as far as the dwindling crevice permitted.

"Fine," groaned Blake. "We want to get out of here."

"I know," sighed the creature. "But I really am as helpless as you are. I'd suggest you destroy me as you did Grugth, but it would do no good. The rest of them would come then."

"What," asked Penton, exasperation in his voice, "are you, anyway? You are a brainless, awkward, sluggish bulk. You are the ultimate of mindless matter. But you learn English in minutes, you read minds, you sound intelligent."

"It is bewildering, isn't it? I'd like very much to help you, but I don't know just how. You see, originally we were intelligent creatures, well adapted to this inhospitable world."

"Inhospitable," groaned Blake, "is not an adequate word."

"But we're really very well adapted." The huge bulk heaved and struggled to drive itself into the impossibly narrow crevice. "I seem to be injuring myself trying to crawl in there. Really no sense at all, you see, in this stupid flesh. But it's a very cleverly designed body. The plains, you know. They stretch out for thousands of miles. These are practically the only mountains on the planet, as you may know—I see you do. And there is so little heat. Therefore, to a compact form like a cylinder, with no heat dissipating, narrow legs are advantageous. And, of course, the more bulk, the more volume in proportion to surface. That's why we are so big. Clumsy, of course, terribly awkward things. But we get along nicely on the plains. I do wish I'd stop trying to squeeze in there. I'm just injuring myself.

"Well, why in the name of space don't you?" Blake exploded.

"I can't, you see. I've evolved too much."

CHAPTER IV

Evolution

PENTON stared.

"Evolved too much?"

"Yes. Originally, as I say, we were

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fairly intelligent animals. This black skin, as you see, passes heat only one way, so we are not cold. We eat oxygen and drink hydrogen, and eat a few other things. Occasionally a *drutheg*. That's one of those round things you thought were boulders. And we sun ourselves."

"What is a *drutheg?*"

"It's—let me see—oh, yes. A sort of plant. It moves around very, very slowly, staying near streams and lakes. Most of them live in streams. They consume water, and nitrogen, and some other things, and sun themselves, and throw out oxygen and hydrogen. There is practically no water on this entire planet; the *drutheg* break it all down to hydrogen and oxygen. All the water there is, is in our bodies; we make it, you understand, from the food we eat."

"But," protested Blake, "that doesn't explain how you come to say you wish you'd stop trying to get in here, but go right on trying."

"As I say, we started as fairly intelligent animals, living on heat and oxygen and hydrogen, but we had to spend all our time, practically, seeking those things. So gradually we developed the ability to think our thoughts while the body took care of itself. You—yes, I see you can walk along while reading a magazine or book. Your mind sort of leaves the body to look after itself for a while. We developed the trick. It took me nearly two hundred years practice—our years—"

"Two hundred of *your* years! That's over 80,000 Earth-years!"

"Yes. Those inner planets do go around the sun at a crazy pace, don't they? As I say—oh, length of life? Well, practically nothing can kill us here on this world and nothing bothers us. We live very peaceful lives, normally. In fact, it is terribly hard to get rid of one's self. We normally live about three thousand years, about a million and a quarter of your years. I'm about a million."

Blake looked at the creature. Black, blunt-ended cylinder, squirming tentacles stretched out to reach them. A million years—

"But I learned the trick, and learned it so well that I spent years on end without paying the slightest attention to my body. Of course, in that time we had developed our language to a considerable extent, and our thoughts. We had deduced nearly all the basic facts concerning space, and began to see the advantages of mechanisms. We were drawing up plans to build a space ship to visit other worlds in person."

The voice sighed, very sorrowfully. "Then we found our bodies had learned a trick, too. It had been nearly a thousand years since any of us had paid any attention to our bodies. Occasionally it had been annoying to have our bodies roll away from someone we were talking to in order to find food. But now we decided to go to work again. And then we made the sad discovery."

The voice deepened mournfully.

"We had forgotten our bodies so long that they had been forced to develop a certain amount of mental equipment. A sort of secondary mind. They had minds of their own, and we can't control them any more."

BLAKE gasped. "Can't—control—them any—more?"

"No. Apparently the nerve-channels connecting the intellectual portion of our minds with the purely physical parts have atrophied. Not one of us has the slightest control. I couldn't be staying here if it weren't that my body feels the heat you radiate and stupidly keeps trying to reach it."

"How," asked Penton, "does that one-way heat transfer of yours work? I'd like to have something like that."

"It works only at low temperatures, with living tissue," the voice explained. "And I can't tell you in your language, and you haven't time to learn mine. We can't control our bodies, but I notice you can't control all your minds either."

"Huh? What do you mean?" asked Blake in surprise.

"Part of your mind is very worried,

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and very busy trying to find a way to get out of that crack in the cliff. It is particularly worried since it took note of a small click that represented the change from the first to the spare oxygen tank. But you don't seem to be aware of it with your conscious mind."

Blake glanced down. A small gauge in his helmet definitely agreed with the creature. Tank 2 was being exhausted slowly but steadily. Simultaneously, almost, Penton did hear consciously the click that meant his tank-mechanism had switched. One oxygen bottle was exhausted.

"Were those full?" Penton asked Blake quizzically.

Blake nodded dumbly. "Two hours—"

"They should have gone three," Penton pointed out.

"May I help? Your subconscious has already figured it out. This world is heavier, you've been working unusually hard, and all your muscles have to maintain a higher tonic property. They are consuming an unusually large quantity of oxygen. You timed those bottles, I take it, on your moon? Gravity was light there, and your requirements much lower."

"That is the answer, but it doesn't get us more oxygen."

"You have also been wondering about that solid oxygen on the floor. You might try it," the voice suggested.

Blake looked down. Bluish, sandy crystals of oxygen swept in by faint winds littered the floor, mingled with tiny particles of rock dust and nitrogen.

"We can try."

Penton unstrapped Blake's tank. Together they swept up the oxygen crystals and poured them into the cylinder's mouth. Nearly five minutes were required to warm them through liquid to gas; then the tank mechanism in Blake's helmet snapped.

Instantly his hands clawed at the valves, turning them down, switching back to the original. "Phew—it smells. You can't breathe that frightful stuff."

"Oxygen," said the voice sadly, "used to have a very pleasant and distinctive flavor, varying with the type of *drutheg* that produced it. We never taste it any more. We don't even feel the pleasantness of heat any more. And heat was a very pleasant sensation."

"So," sighed Penton, "I notice. That gang around our ship—"

"They are very sorry, but there's nothing at all they can do. They don't have control, you see. Ah—look. I do believe I've seriously injured myself at last."

The tentacles writhed back, the leathery protective membrane snapped back over the cylinder's blunt end, but not completely. The monstrous thing had succeeded in jamming itself into the crevice to a considerable extent, and a sudden wriggle had brought an abrupt collapse of one side of the thing.

A thick, gummy substance was spurting out, to harden instantly as it touched the frightfully chilled rock. "I think," said the voice with an air of pleased surprise," that I've finally succeeded in killing myself."

"Succeeded—you sound pleased!" Penton stared at the huge thing, flopping erratically now, struggling to get free once more.

"Naturally—oh, yes. The bone was broken, and it's pierced a main blood vessel. That should take about ten minutes. Wouldn't you be pleased to get free of this stupid, useless lump of awkward flesh? Naturally I'm pleased. I know Grugth was immensely satisfied when he succeeded in setting up his force-pattern, after nearly twenty-seven hundred years."

"What," asked Blake, "is a force pattern?"

"I can't quite explain," the voice said rather hurriedly. "I haven't much time. I'll have to start setting up mine. And anyway, your language is strictly limited. I have been working out the basic structure of my pattern for nearly 1,000,000 of your years. Do not mistake; my mentality compares with yours only when speaking your language. I have spent over one million of your years in unending thought and study. I could solve any problem for

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you—instruct you in making the weapon you need, or in generating pure force-fields to return you to your home planet, had either your language or your brain the necessary capacity.

"But I must leave you, for this flesh of mine is going rapidly. "Good-by. I believe your subconscious has a solution to—no—water—water—" The voice stopped. A slate-blue tinge crept out from the wounded side of the monster. Slowly, the immense bulk flattened down, the muscular tension that had held it in a round, powerful figure was dying. Logily it rolled off the cold, dead thing beneath it. The ground shook faintly with the hurried coming of others of the Titan beasts. Coming to feast on the heat escaping from the carcass.

"I think," said Penton softly, "I begin to get it. Mindless flesh, and super-minds, super-minds imprisoned in stupid things. Stupid bodies, however, cleverly designed by the never-ending plans of Nature to survive on this incredibly inhospitable world. Their leathery hide is black because it absorbs all light, all energy that strikes it, and converts it to heat. There's darned little heat, but what there is they absorb, and won't let out. By accumulation, they end up with a very considerable supply. With death, that membrane passes heat both ways, that is, the heat stored escapes. They are, by purely involuntary reaction, attracted toward any source of heat, of course, so they absorb the heat of the dead hulk, as they seek our heat, and the heat of the ship. Quite involuntarily."

"Quite, I assure you," added a new voice. "I'm sorry your weapon is so nearly exhausted. The fuel-wires are almost spent?"

"About three shots left in each, I guess." Blake agreed sorrowfully. "They weren't intended as weapons. We didn't expect any life here."

"There's life on every planet of the System," the speaker assured them. "You will meet most of the important forms."

"Could you tell me how to fix these proton projectors so they'll fire a few more shots? That might give us a better chance to see those other forms of life," Blake suggested bitterly.

"Sorry. Your language isn't up to it. If I could control your bodies, or my own, I might be able to do it. But if I could control my body, you wouldn't need them fixed, and I'd have made up my force-pattern ages ago."

"What is this force-pattern?" Penton demanded. "The last one of you who spoke to us mentioned it."

"At the instant of death, the mind, the pure mentality is released. Thought has power; the fact that one mind can influence another indicates that. If properly managed at the moment of death a vortex in space can be made, and the vortex is stable through eternity, unless the mind desires to break it down. It is utterly free to propel itself where it wills. Stray energies of space give it power if it chooses to increase its intensity. But it can be achieved only by the dissolution of the physical brain.

"And," the voice was bitterly sorrowful, "I can't control this stupid bulk long enough to destroy it. Any of us would gladly aid you back to your ship if only you would destroy these masses of flesh and release us."

"The only masses of flesh that stand any chance of destruction," Penton pointed out, "are our own. And we are not at all anxious to lose them."

"I know. I am sorry. I'm afraid—I am going." The ground shook slightly. Three immense cylinders rolled awkwardly away across the plain, to feed at the margin of the little lake.

Faintly, a warning came back.

"If you step out, I'll have to come back. I—" The voice faded beyond the power of the tranceivers.

CHAPTER V

Example

"WHAT in blazes are we going to do?" Blake demanded. "They are friendly, they're brilliant,

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no doubt, but they're still stupid, brainless, annihilating Juggernauts."

"Blazes," said Penton softly. "What in blazes. In blazes, of course." He laughed. "Stupid of me. Remarkably."

Blake looked at him silently. Then: "I'm stupider. What about blazes?"

"Hydrogen," said Penton, "a river and a lake of hydrogen. A lake of hydrogen with a beach of solid oxygen. 'Water' was what the one called just before he set up—his force-pattern. They want to die; well, by the gods of space, they will. They have to go toward heat, whether they like it or not. Hydrogen and oxygen make water—and a hell of a lot of heat."

"Oh," said Blake softly. "So they do." He looked out of their little crevice. Thirty feet away the little stream of liquid hydrogen crept through little islands of solid oxygen.

Penton climbed up on the bulk of the dead, frozen monsters, leveled his proton projector at the rim of the little stream, and pressed the button. A fierce, flaming spot of incandescence exploded both into their primal gases, swirled them violently. Licking lightnings spun and shattered on other crystals and liquid drops.

And the heat died. Two huge cylinders started rolling, but stopped as the last trace of the heat vanished. Liquid hydrogen rained back from the air, solid oxygen snowed down.

Penton stared.

"Blake, it didn't burn!"

Blake looked blankly at his friend.

"It just has to. The laws of chemistry can't be that different. That must have been a freak—a chance, because the stuff is so cold out here. Try again."

Again Penton shot the flaming energy of the protons crashing into the margin, where hydrogen lapped against the solid oxygen. Again the explosive rush of solid and liquid abruptly converted into gas—and again it settled as liquid rain and solid snow.

Penton looked at his friend, and shrugged his shoulders.

"New laws of chemistry, I guess. They won't burn. That's out."

Blake sighed.

"My oxygen tank is getting low. And the valves aren't working right. I had to fuss with them several times. Guess I jammed them when I tried to turn off that damned odor. Maybe that smelly stuff is some kind of catalyst that prevents combustion."

Slowly he turned up the oxygen valve, cursing fluently.

"The valve stuck again, and I nearly passed out. It would have made a lot of difference, wouldn't it?"

"Not much that I can see," admitted Penton. "No weapons. No way to hide. We can't wait until they just wander away. No way of restoring our oxygen. No way of reaching the ship."

Blake only growled and turned up his oxygen a bit. Slowly he got to his feet, his panting stopped by the renewal of the oxygen supply. He walked over toward the dead things, climbed up on the lower one to look across the plain. Near at hand the stubborn stream of hydrogen twisted through new channels between the blasted pits where Penton's protons had exploded shore and stream alike into gas.

BLAKE reeled slightly.

"Stupid," he muttered. Shtupid beassh. Stupid hydrushen, stupid oxyshen. Won' burn. Here, shtupid, water. Make thish shtuff." Blake was gloriously drunk; his oxygen control was stuck again, wide open, and he was thoroughly intoxicated by the excess oxygen. Penton looked up and climbed hastily toward him as he unscrewed the water bottle from his space suit, and hurled it out toward the stream. "There, shtupid hydroshen, make 'at shtuff." He raised his proton gun waveringly, and pressed the button.

The explosion sent him flying backward, crashed him into Penton, and sent both tumbling back into the crevice. An immense, mile-high jet of blue flame licked roaring into the black sky, a finger of fire that reached to the stars. The tiny stream of hydrogen vanished in the fiery heat, the

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oxygen melted, boiled, hissed into shrilling flame. A darting line of flame licked along the brink of the lake, consuming oxygen sand and hydrogen water alike, shouting and howling. In seventeen seconds the lake was ringed by flame, the hydrogen-fall was a cloud of ascending gas.

Two thousand bulks were joyfully, thunderously flinging themselves into the mighty pyre, to explode in sudden death as their tissues boiled. Thundering down slopes to that heat, the brainless bodies reacted only to an instinctive search for heat; never had they met killing heat.

Penton clamped down Blake's oxygen valve, and heaved him to his feet, starting him running. The flames were half a mile away now, a vast circle of fire reaching to the skies. There was neither oxygen sand, nor hydrogen stream here. At the point where it left the lake, the stream was flowing upward as flaming gas. Only bare, faintly warm rock lay exposed. Blake straightened before they had gone a hundred feet, shook his head and opened his valve slightly.

"Oxy-drunk. My God, what happened?"

"Shut up and move," Penton grunted. "Turn the oxygen a little high, but don't get drunk again. We have to get to the ship before others of those beasts arrive, and before that fire goes out completely. It's almost a mile."

Burdened by their greater weight, they plugged along as best they could. Presently, they arrived at the ship. Penton carried him into the lock, and slammed the great door shut.

"What happened?" gasped Blake weakly, as he opened his eyes.

"Water," Penton grinned. "Water —just as we were warned. It needed a sample, just as you gave it. Hydrogen and oxygen will not unite in the total absence of water. It's old, but I never thought of it. And all those *drutheg* working, and reworking that stuff for that last, ultimate trace of water. It wouldn't burn until your water bottle supplied that trace it needed to start. Let's move into the ship, and clear out for warmer planets."

IMPORTANT ANNOUNCEMENT

IN THE NEXT ISSUE, WE ARE PROUD TO PRESENT AN ARTICLE ON THE CELESTIAL BODIES BY

SIR JAMES JEANS

—World's Most Famous Astronomer!

MASTER MIND

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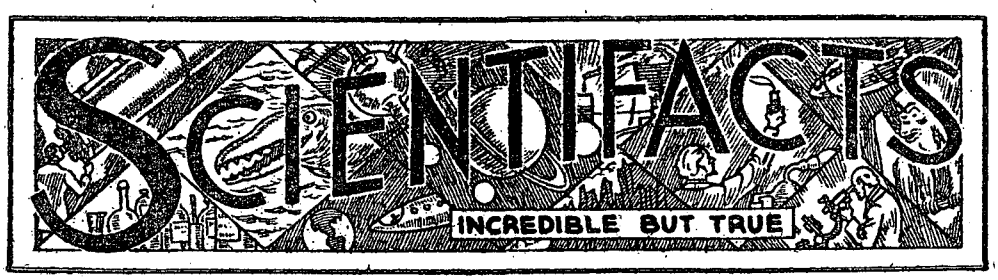

A BRAND-NEW, FASCINATING FEATURE

By J. B. WALTER

A MAN WON'T FREEZE AT ABSOLUTE ZERO!

THERE is but one place where the absolute zero of temperature can exist; in outer space between the distant stars. Here it is said the temperature is 273 degrees below centigrade zero. But if an inter-world traveler

were equipped to breathe properly and resist the change in pressure he could step out upon the wing of his plane and remain there for a long time without discomfort from the cold.

The explanation lies in the fact that he would lose his body heat very slowly. In order for him to feel cold, this heat would have to radiate, but since he would be moving in a vacuum, insulated from the nearest object by thousands of miles of empty space, the rate of radiation would be too slow to cause him discomfort from the intense cold of outer space.

THE DEAF CAN HEAR BY HAND!

THE touch organs of the skin can detect vibrations and distinguish between variations of vibrations. Sound is of course but a vibration. Unaided, the organs of touch are not sensitive enough to replace the organs of hearing, but a machine has been perfected that makes it possible to distinguish between vibrations as high as 2700 to the second.

This is higher than the pitch essential to human speech. The machine consists of a microphone, an amplifier and a receiver. The receiver is similar to that of a telephone, and the subject places his fingers lightly on the exposed diaphragm. Speech vibrations are easily felt and in time the subject learns to distinguish words. In conjunction with lip-reading this affords the ideal aid for those who are deaf.

COLOR IS A MEASURE OF CIVILIZATION!

TO determine if one race or another is more civilized, or, looking back over history, to decide the degree of civilization reached by nations now long since scattered over the earth, many scales have been employed. In our own time the consumption of sugar per capita has been suggested as an index. Another one proposed has been the amount of sulphuric acid employed. And Americans like to think of the kilowatt output of power and light as a measure of civilization.

But these modern indices fail when we attempt to determine the degree of civilization of races extinct before either sugar or sulphuric acid were common commodities. The philologists offer a new measure. It is known that primitive races have a low sensitivity to color. The lowest races recognize and have words for only red and yellow. Blue and green are so familiar to them that, like the all-prevading air they breathe, they are ignored. More advanced races have words for all the

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simple colors, and the most advanced civilized races have words to describe an infinite variation of tone, hue and intensity.

THE EARTH MOVES FIVE WAYS AT ONCE!

WE are all accustomed to think of the earth as moving around its axis and along its great orbit. These two motions far from complete the complicated path of this planet. It shares in the movement of the sun toward the fixed star Vega, which is located in the constellation called Lyra. This is no modest motion.

The sun plunges toward this star at the rate of twelve miles a second, and

carries the whole Solar System with it. The sun also revolves on its own axis once in every twenty-five days, and this has an effect on the motion of the earth. Finally, the whole stellar system revolves on its own axis, which introduces a fifth force to influence the movement of the earth.

MULTIPLICATION BY DIVISION AND ADDITION

RUSSIAN peasants, who have a certain amount of business to do, but have not had the advantage of much education, can still multiply any two integers regardless of the number of digits involved, if they are able to add, double a number, and halve it. Until the present regime it was the peasants' regular method of calculating the value of their crops.

The two numbers to be multiplied are placed side by side to head two columns. One is halved until the final result is unity. Each answer is placed beneath the preceding one. Remainders are discarded. The other number is doubled as often as there is a corresponding half in the first column. Every number in this column level with an even half is ignored. The others are added together, and their sum is the desired quotient. An example will clarify the method.

259	by	376
129		752
64	out	1504
32	out	3008
16	out	6016
8	out	12032
4	out	24064
2	out	48128
1		96256
		97384 (Answer)

MAN IS LOSING HIS VISION!

MAN'S best vision today is inferior to the power of sight of the average ancient man. Even with his eyes corrected with glasses, few living men see more than seven stars in the constellation, Pleiades. Under especially favorable conditions, some men can count eight stars. The Pleiades actually contains eleven, visible with the aid of a good telescope.

Ancient men needed no special aid to see ten of them, and left on cave walls drawings depicting the ten stars in their proper places. Astronomers assure us there has been no change in the brilliance of this constellation, nor can we believe that atmospheric conditions in mountain regions far from industrial centers, or in the middle of the ocean, have changed enough to account for poor visibility. We are left to conclude that the only tenable explanation is that ancient men had better vision than we enjoy today.

SOUND KILLS GERMS!

THE latest use to which sound has been put is the killing of germs. Many dangerous bacteria die when subjected to vibrations which are of the frequency of sound.

The employment of such vibrations, some audible to the human ear, some slightly beyond the audible range, is coming to have many industrial uses.

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The grain of photographic emulsions is improved, dust is precipitated, chemical reactions are speeded, and it is said that a recent invention employs sound to cripple enemy air-craft.

THE SPIDER IS NOT AN INSECT!

THE basic form of the insect requires that it have six legs. Spiders belong to a very special classification, the Arachnida, in which are included scorpions and mites. They have no antennae. They have eight legs, which property alone is sufficient to disqualify them ffom the insects.

THE SOIL IS ALIVE!

WE may speak glibly of the dead soil, but it is doubtful if a single gram of the earth is not densely inhabited. A tablespoonful of garden earth contains more living creatures than the population of the United States. Within a single gram there live from 450,000 to 22,500,000 bacteria and from 150,000 to 280,000 amebae.

The variation is not due to different samples, but to the shortness of the life cycle of this simple life. A new generation is born with each fifteen minutes.

THE SEA LEVEL IS NOT LEVEL

IF the depth of the sea were uniform, the surface of the waters would form a perfect ellipsoid of revolution. But the surface of the sea is broken by protruding and irregular land, which has a mean density two and six-tenths times as great as the density of the sea-water. This alone causes a piling up of water on the shore lines. And to this cause of deformity must be added the action of wind and sun.

Steady trade winds sweep the waters of the sea toward the shore. The hotter sun rays at the equator cause an expansion which raises the level of the sea along this zone, twenty feet higher than at the poles. Calculations indicate that the combined action of these various forces, if acting together, might cause a difference in sea level as great as six hundred and fifty feet. As such a combination of forces would be rare, no such difference has ever been observed. However, differences in level in excess of three hundred feet have been noted.

DEATH DEALER IS A LIFE-SAVER!

CARBON monoxide is used to save life! This gas, which in our world of automobiles is known to everyone as an insidious and fatal killer, has been compelled by scientific magic apparently to reverse its role. The blood of a dog was drained until it was at the point of death from acute anemia. The blood of another dog was treated with carbon monoxide, which had the effect of de-oxygenating its red blood corpuscles.

This blood was then transfused to the first canine. The animal that had been at the point of death immediately began breathing at a greatly increased rate in order to obtain the oxygen required for the new blood in its circulatory system. Thus, stimulated, the creature was restored to vigorous life in short order.

THE GLOW WORM CAUSES SUDDEN DEATH

NOTHING could appear more harmless than the tiny glow worm who causes such brilliant flashes of phosphorescence in the ocean. Yet this almost invisible insect produces a poison which science has found no means to counteract.

It is fortunate that there are but few means available for this poison to gain admittance to the human system. But a few years ago a series of deaths occurred, which must be blamed upon the glow worm. By some chance they had made their abode between the shells of living mussels. They did not affect their host, but when the mussels were eaten by men, death followed swiftly.

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EIGHT DAYS in the

Especially Written for
THRILLING WONDER STORIES
By WILLY LEY
World's Foremost Authority on Rockets

EVERY technical development has its great days.

The steam engine will always bring to mind the famous race in England when Stephenson's *Rocket* achieved world fame. Railroad transportation and railroad travel began

Willy Ley

with that memorable day. In the history of aviation Lindbergh's transatlantic flight and the first trip around the world made by the Graf Zeppelin stand out as important milestones.

The science of rocketry is new and still in its infancy. But already it has had a few great days, some of them known, some not. Which event seems most important and most significant to me, I cannot tell. Much as they differ from each other, all bear some vital importance to the development of rocketry. The viewpoint of posterity can seldom be foretold; it might attribute significance to an event that seemed slight to the contemporaries and it might utterly neglect an incident we considered important.

One of these eight days of which I am going to tell historians of the future will term "the Beginning."

FROM THE ARCHIVES OF THE CZAR

(April 10th, 1881)

ON March 22nd, 1918, Professor Nikolai Alekseyevitch Rynin of the Technical High School in Leningrad received a letter from Professor Pyotr Sergeyevitch Shtegoloff, editor-in-chief of the *Builoye, (The Past)*, stating that Comrade Shtegoloff would appreciate receiving promptly the criticism of Comrade Rynin regarding an accompanying manuscript, found among the documents of the secret police of the late Czar.

Rynin opened the document and began to read. His eyes bulged and he drew in his breath sharply. This manuscript, dug out from a musty pile of documents concerning cases of high

Milestones in the History of Man's Mighty

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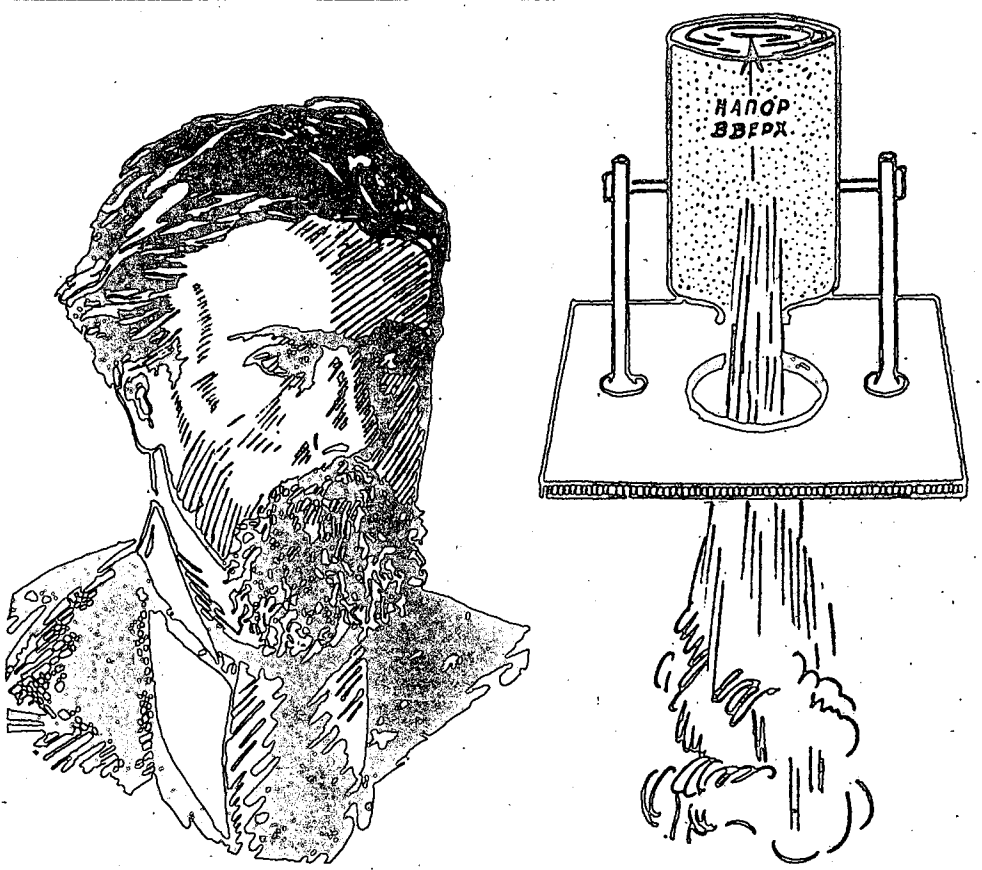
Story of ROCKETRY



Nikolai Ivanovitch Kibaltchitch, one of the first inventors to conceive the idea of rocket airplanes. His sketch shows that he did not think of wings; he planned only a platform lifted and moved by the reaction of a powder rocket motor. This picture is taken from Mr. Ley's book, Grundriss einer Geschichte der Rakete *(Synopsis of the history of rockets).*
Copyright by Willy Ley.

treason during the reign of the Czar, contained the description of the first rocket airplane!

Rynin read on eagerly. The document related to the sensational trial of the 7th, 8th and 9th of April, 1881, involving six members of the revolutionary party, "Narodnaya Voina", ("Will of the People"), notably A. Shyelyabov, N. Ryssakoff, and Nikolai Kibaltchitch. These men were charged with the assassination of Czar Alexander II. Shyelyabov had been their fiery leader. He talked propaganda constantly during the trial. Ryssakoff had thrown the bombs; desperate, he was ready to tell everything.

Kibaltchitch admitted manufacturing the bombs. He did not speak at all, because his analytical mind was working on other things. Finally, when at his request scientific experts were sum-

Effort to Conquer Far Horizons of Space!

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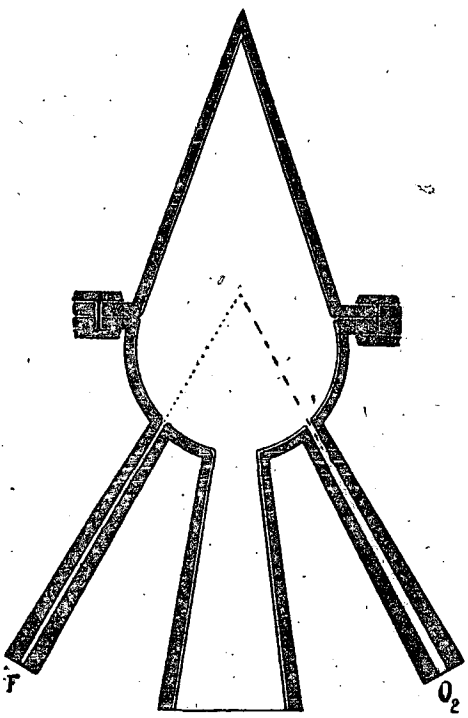
moned, he spoke. He argued with them about various technical details and made inquiries about explosives that had the experts nonplussed. Then he asked for paper, pen and ink. In the grim, grey hours before dawn Kibaltchitch wrote swiftly and unfalteringly. Every once in awhile he would stretch his weary arms and pace his little cell, knowing full well that he would face the firing squad before the ink had dried on the paper. He was determined to record his design of an invention before he was executed.



Scheme of the "Kegeldüse," designed by Professor Hermann Oberth. This rocket motor received the first official testimony. It was built of steel with copper lining on the inside, O2 and F are the injection nozzles for liquid oxygen and fuel.

Thus the manuscript handed to Professor Rynin had come into existence, a design for an airplane propelled by powder rockets. It must be remembered that at this time there existed neither airplanes nor airships; only balloons. Officials blandly promised Kibaltchitch that his manuscript would be submitted to a committee of technical experts at once. After he was shot it was read casually and attached to the documents of the trial by some filing clerk because its subject would "only have aroused undesirable public interest."

Professor Rynin reported that the invention outlined by the dead Comrade Kibaltchitch did not offer a satisfactory solution of the problems concerned. And that was that, he thought.

But when Rynin issued his statement, interest *was* aroused. Only then it was no longer "undesirable". Books on three mechanics of the rocket were being published in Russia as well as in other countries. Soon experimentation was to begin the world over. Just how much more would Kibaltchitch have discovered had he not been shot? Scientists wonder.

THE "MAD" INVENTOR

(May 27th, 1891)

THE "Philharmonie", in Berlin, is a hall devoted to concerts of classic music, played by a famous symphony orchestra. Occasionally lectures are given in its spacious halls. On May 27th, 1891, a lecture on aviation was scheduled to be given in the hall by one Hermann Ganswindt.

Ganswindt was a mild little man with intense blue eyes. He was not a professional scientist, he made clear to his audience, but called himself an inventor, contending that he could construct a flying machine.

The Berliners, noted for their dry and caustic humor, laughed at this "far-fetched" suggestion of airships and airplanes. But since the lecture was taking place in the Philharmonie, *something* could be expected. So they attended it. Much to their surprise, they found a man who looked neither insane nor hungry, and who spoke convincingly about airships and their possibilities.

He spoke confidently as well as convincingly, and maintained that an airship would be possible if somebody would dare to build it large enough. Forcefully, he made his audience follow the logic of his words. He then proceeded to explain the principle of his airplane; a helicopter. (It actually flew in March, 1902, with two passengers.

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However the flight was only for a few seconds and the helicopter was guided by a steel rope to prevent a possible sideslip.)

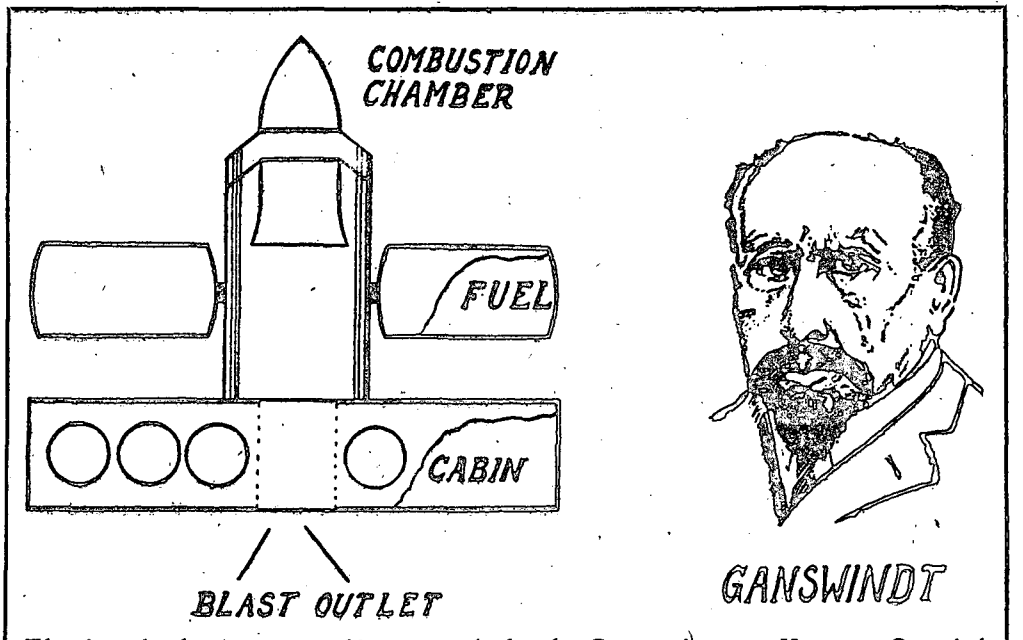
Finally Hermann Ganswindt mentioned the problem of interplanetary travel. Even this problem was not insolvable, he claimed, since the power of recoil works in a vacuum. High explosives could be used to propel such a ship, he predicted—and rightfully.

Ganswindt had no inferiority complex but he did not trust the results of his calculations when he first conceived his idea. So he submitted his plans to a few of the leading physicists of his time. They studied them, pondered the problems involved, and finally admitted hesitantly—*very* hesitantly—that they could not detect a mistake in the logic of his reasoning.

The Philharmonic audience did not know what to think about all this. They had come to laugh at fantastic talk of airships. Now they were informed about space ships and possible future flights to Mars and Venus; it still sounded sane. They did not dare ridicule the lecturer, but they were far from believing the space-rocket idea.

The result was that Ganswindt found closed doors everywhere. He could not even sell his mechanical cars, the forerunners of the automobile. Finally, after he had sacrificed his private fortune for his ideas, he was imprisoned for a short time because he "had received money under the promise of building impossible machinery, such as horseless cars, airships and airplanes."

This was in April, 1902. Other inventors soon began to build automobiles, dirigibles and airplanes. Ganswindt was ignored. Many years later, in 1934, he was officially recognized by the German government as a contributor to science. Three weeks later he died.



The first sketch of a space ship was made by the German inventor Hermann Ganswindt more than fifty years ago. Ganswindt conceived a long cabin which was to rotate around the blast outlet after the rocket motor had given the ship the necessary velocity. Thus he wanted to create "artificial gravity" for the passengers. During the period of rotation the two circular end walls of the cylindrical cabin would be the "floors" of the cabin. At right: Ganswindt at his 72nd birthday.

OBERTH VS. LORENZ

(March 12th, 1928)

IT was in the morning, and I had a little argument with the customs

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officials of the Free City of Danzig. I had just received a heavy parcel, containing ten copies of my book, *Die Möglichkeit der Weltraumfahrt*, ("The Possibility of Interplanetary Travel") which had just been published. Said customs officials wanted me to pay duty on these books. It was not necessary for me to pay duty on my own books and it required the purchase of a paper to get them in without charge. I bought the paper. Incidentally, it reported that the annual meeting of the WGL *(Wissenschaftliche Gesellschaft für Luftfahrt)* would commence on the same day and that the theory of rocket flight would be discussed there.

In the evening I met Professor Hermann Oberth for the first time. He had come all the way from Roumania to take part in the dicussion. Oberth was the man who had started rocket research in Europe with a book published in 1923. It was not the type of book read for pastime. Of its eighty pages, sixty consisted of mathematical formulae. But to those who had sufficient patience and enough knowledge to follow the author, the book's eighty pages meant a new world. They proved that the conquest of space of rockets is only a question of time and money, but that this task is not beyond present day knowledge.

One man, Herr Geheimrat Professor Dr. Lorenz, of the Technical High School at Danzig, had commented unfavorably. He did not agree with Oberth's formulae and doubted the mathematical conception of a space rocket. The WGL meeting was to end the printed controversy. A debate was scheduled between Professor Lorenz and Professor Oberth. Both arguments were presented and eventually only one question remained—whether it would be possible to build a rocket with fuel tanks that had sufficient capacity to hold twenty-one times the weight of the rocket in fuels. And then Oberth asked innocently whether it might be possible to build an aluminum kettle able to hold twenty-one times its own weight in water.

Professor Oberth and myself went home, considering the battle won. Five days later Oberth and I said *"auf wiedersehen"*—both thinking that it would take a long time before we would see eath other again. But in the fall of the same year, Oberth again came to Berlin.

THE GIRL IN THE MOON

(October 15th, 1929)

A FEW days before the above date I received a registered letter. It was from Fritz Lang, and contained two tickets and an invitation for the first showing of his film, "The Girl in the Moon", at the Ufa-Palace on the Zoo, the most fashionable cinema in Berlin. The novel on which the film was based had been written by Thea von Harbou. It had been inspired by the two books mentioned—Oberth's staggering eighty pages and my own.

In the fall, 1928, it had been decided to turn the novel into a film. Professor Oberth had been called in as technical adviser. I went with him to the studios. It was literally "on the moon" (the moonscape had been built in the largest studio available and covered a few acres) that I met Hermann Ganswindt for the first time. Later I wrote most of the scientific publicity for the film which took one year and one and a half million marks to make.

Soon the film was ready to be presented to the public. But more, important, the plans for the first actual rocket were ready and practical experimentation had already begun. The Ufa Film Inc. was to sponsor the project. We had had many conferences about it. Among those interested were Oberth, then president of the German Rocket Society which had been founded in 1927 by Max Valier; Johannes Winkler; A. B. Shershevsky, a Russian scientist living in Berlin; Rudolf Nebel who had become Oberth's assistant; and myself.

The plans were ready, but scientific experiments cannot be hurried and, as Oberth put it later, "inventions cannot be made on schedule." The sponsors had made the schedule as sponsors like to do, asking for minimum time and feeling most generous in allowing two weeks more. The scientists could not work on schedule. Eventu-

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ally, the sponsors stopped payments and the scientists vowed never to touch a tool again. And the first rocket remained uncompleted.

It has to be added that every one of us soon broke his oath never to touch a tool again. We all have built rockets since—rockets that flew.

ROCKETRY'S FIRST MARTYR

(May 17th, 1930)

I HAD been in the office of the German Rocket Society in the morning and, finding nothing to do, had gone to the library. When I came home, I found an urgent telephone message from Nebel. It read:

Max Valier dead. Nozzle exploded. Meeting of the board of directors tomorrow 5 P.M.

Max Valier, one of the founders of the Rocket Society, had become the first martyr of rocketry. It was hard to believe. We had been together a few days previous — Ganswindt, Valier, Winkler, Nebel and I. (Oberth was in Roumania.) Valier belonged to the board of directors of the society, but he had worked independently. While the society had purchased the unfinished Oberth rocket from the Ufa Film Inc. and was planning to do experimental work with it, Valier had become associated with a factory manufacturing liquid gases. Having been responsible for Fritz von Opel's rocket-driven cars and railroad cars, Valier had followed this line and had built the first rocket car for liquid propellants.

It had made successful test runs, but Valier was not satisfied with the efficiency of his rocket motor. He wanted to improve it for a run which was to take place on the occasion of an exhibition of aircraft. He had worked all day and prepared for a test in the evening after the workers had left the factory. What actually happened will always remain unknown, but suddenly the steel nozzle was hurled from the rocket motor. It hit Valier, and wounded him mortally.

Oberth arrived just in time for the exhibition. The society had its own stand where the first Oberth rocket, Nebel's *Mirak*, and a number of other rocket motors were being exhibited. Oberth and I were present most of the time, explaining and delivering short lectures to the public. Three days later we had to attend Valier's funeral. In the afternoon, we were back at our stand at the exhibition, explaining and answering questions. Soon afterward, the first rocket motor was put to the first official test.

THE FIRST TEST

(July 23rd, 1930)

THE suburban district of Tegel, near Berlin, boasts of having within its imaginary walls the *Chemisch-Technische Reichsanstalt;* the institute for chemistry and technology. Whatever developments there are in this line within the borders of the *Reich* is brought to the *Reichsanstalt* for recommendation. Naturally, the first rocket motors went the same way. There were two, one of them termed *Kegeldüse* on account of its conical shape, *Kegel* being the German for cone. Professor Oberth, Rudolf Nebel and Klaus Riedel, a young engineer who had joined the staff of the society, worked for more than three weeks out there. They made many preparations to be certain of a smooth performance.

An instrument was constructed to measure the thrust of the rocket motor. The containers for liquid oxygen, an extremely unpleasant stuff to work with (being close to two hundred degrees centigrade cold) had to be installed. There were a thousand and one things to be done.

The date for the official test was set for July 23rd, 1930. The first test run was to be made at 10 A. M. When I arrived at 10:30, after having had all sorts of traffic delays in the complicated series of rides on buses, subways and trolley cars necessary to reach the institute, there was no rocket motor to be seen. The scientists of the society, the scientists of the institute, the visiting scientists from other institutes, and the science editors of the newspapers were sitting peacefully and very wet under shelter and looking occasionally at the sky. It was raining.

I have seen violent cloudbursts, but I have never seen a rain like the one

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we experienced at the *Reichsanstalt.*

After a few hours the rain lessened. We dashed out and let one rocket motor run. It was the one that was only to demonstrate the principle; thrust could not be expected. The motor worked nicely. Then it rained again for half an hour or so. Finally the *Kegeldüse* was mounted and fired. It burned exactly as had been prophesied. The photographers ruined their cameras in the rain, the editors their notebooks. The scientists, with but few exceptions, caught colds.

But a few days later an official document arrived, signed by Professor Dr. Ritter, the director of the institute. It testified that the *Kegeldüse*

—had burned under my (Dr. Ritter's) supervision for 90 seconds without any mishap, consuming 6 kilograms of liquid oxygen and one kilogram of gasoline and delivering a constant recoil of approximately 7 kilograms.

THE REPULSORS

(May 17th, 1931)

THINGS had changed very much in the meantime. After the tests at the *Reichsanstalt,* Nebel and Riedel had left Berlin, taking the rocket *Mirak No. 1* with them for some quiet experimentation in a little town far from Berlin. When they returned, Nebel began looking for a conveniently located proving ground near Berlin.

We found an unused plot of land, not far from the *Reichsanstalt.* It had been an ammunition dump during the World War, and nobody wanted it. It was thickly covered with underbrush, little trees grew everywhere, and the massive concrete barracks were surrounded by high walls which had been made to prevent a possible explosion from spreading from one barracks to another. Thus the plot was unsuited for any kind of commercial business, but it was well suited for our purposes.

It received the name of *Raketenflugplatz*—Rocket Proving Ground. The winter was spent in furnishing and equipping two of the concrete buildings, one as a living place for the technical staff, the other as workshop. In the spring of 1931 it was ready for use.

At that time, Klaus Riedel finished a new type of liquid fuel rocket, which I termed *Repulsor,* in order to distinguish it from *Miraks,* Oberth-rockets, sky-rockets and coast guard rockets. One morning on a holiday, when no one was at the field, Riedel took his first *Repulsor* out of the workshop and charged it with only a fraction of the fuels believed necessary for actual flight.

Riedel had no other intention than to see whether the feed lines were clear and the valves in working order. Much to his surprise, his *Repulsor* suddenly lifted itself from the ground and climbed to an altitude of about two hundred feet. Then the fuel supply gave out; the *Repulsor* dropped back and was partly destroyed since it had not been equipped with a parachute.

Riedel at once phoned me and promised to have the repairs made in a few days. The repairs were made and the liquid oxygen ordered for May 17th, 1931. I had two out-of-town visitors with me when I went out to the *Raketenflugplatz.* On the way one of them remarked that it was the anniversary of Valier's death. He added that it might be an unlucky day.

It was. The *Repulsor* rose a few feet, knocked against the wall of a nearby building and spent its power in a series of loops in the air. During these loops, the cooling water found a way out of the water jacket around the motor, the combustion chamber opened up on one side and the rocket went into a power dive that ended on the ground. But we were not discouraged. We had learned from this experiment that the rocket motor worked in any position. Six days later a second improved *Repulsor* was ready.

It took off late in the afternoon of May 23rd, 1931. With ever-increasing speed, the *Repulsor* ascended vertically to an altitude of about a hundred and eighty feet, then it changed slowly to horizontal position and roared with full power across the *Raketenflugplatz.* At the border of the proving ground, the fuel supply gave out. The *Repulsor* continued its flight silently and steadily like a projectile, reflecting from its smooth aluminum fins the red rays of the evening sun.

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We wondered about the outcome of the experiment, and were much afraid when we followed hurriedly the path of the *Repulsor* that had disappeared from sight. We visualized damage to property of other people, crushed skulls and unpleasant conferences with police officials. Finally we discovered our second *Repulsor* dangling, badly broken, in the branches of a high tree. There was no damage, except to the tree and to the rocket.

The experiment decided the further policy. Oberth-rockets and *Miraks* were abandoned and only *Repulsors* built. Improved models made flights higher than two miles and covered distances greater than three. The flimsy first model which could be carried under one arm finally developed into a heavy projectile with a starting weight of approximately two hundred and fifty pounds.

EXPERIMENTS

(February 23rd, 1936)

THE rocket airplane, *Gloria*, was an interesting looking little affair of all aluminum construction, about eleven feet long and fourteen feet, six inches across. The fuselage was square, about ten inches wide in the middle, where the wings were attached to it. The whole thing looked smooth and, due to the absence of motor, propeller, and landing gear, somewhat strange. The nozzle of the rocket motor, protruding from the rear end of the fuselage just underneath the tail surface, looked like the barrel of a gun.

There were three months of experimentation in this rocket motor which proved to be worthwhile. It had made a most satisfactory test run of more than forty seconds on January 1st, 1936, on a city pier at the Hudson River. It was extremely cold during this test run and the pier was thickly covered with snow. The rocket blast melted a strange gaping hole in the ice at the pier. We melted a few more holes in the snow and ice at Greenwood Lake soon afterward.

The flight of the *Gloria* had been scheduled for February 9th, 1936. A week before this date both airplane models (there were two, both exactly alike, even the name) were brought to Greenwood Lake and a catapult was erected on the ice. The theory was that the airplane models should be projected from the catapult at an angle of twenty-three degrees, thereby attaining flying speed. Then the rocket motor was to let the model climb under the same angle for about thirty seconds, covering distance and gaining altitude at the same time.

After consumption of the fuel, the rocket airplane would be a glider and cover the rest of the distance gliding. All this was nicely calculated, checked and rechecked. That it did not come true was due to a number of unforeseen circumstances, mainly the inclemency of the weather.

This time it was not the rain, as at the *Reichsanstalt*, but the snow. There was an unbroken series of blizzards that made work in the open almost impossible. Miraculously the planes were assembled in time and even the catapult was made ready. But when we woke up on the morning of February 9th, there was a blizzard coming up. In less than thirty minutes the airplanes were so thickly covered with snow that I feared for the wings. And instead of preparing for the flight we had to build a tent to protect the planes.

Though the weather became fair in the afternoon, it was impossible to make the flight. The humidity in the air had almost reached saturation point and the liquid oxygen could not be filled into the tank. All feed lines froze during the procedure; the valves were covered with ice.

Just to test how much oxygen had been fed into the tank, the rocket motor was ignited. The nozzle spouted a long yellowish flame—it was obvious that there were only traces of oxygen present. The flight had to be postponed for two weeks; meanwhile I secured the services of Mr. H. Franklin Pierce and Mr. Louis Goodman, both members of the American Rocket Society.

Together we tore the rocket assembly apart, readjusted the motors, replaced the feed lines, installed a new valve releasing mechanism. Then we

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tested the motor again. This was done by strapping the airplanes to a toboggan which in turn was anchored by means of a thin copper cable to a solid support. The tanks were charged with only a fraction of the fuel to be used in actual flight and I ignited the motor while Goodman released the valves.

The first plane worked satisfactorily and the second one was strapped to the toboggan. It received a quarter of the full charge—after all, it is a pity to see a well working rocket motor stop firing for lack of fuel. The copper cable was laid out in a wide loop on the ice to allow a restricted movement of the sled. When the motor caught fire, the plane started racing over the ice and, to my great surprise, it did not stop where it was supposed to come to a standstill. The rocket, once in motion, had torn the new cable without any perceptible effort.

WE had better luck with the weather on February 23rd. It was a cold but exceptionally fine and clear day.

The first airplane was fueled and placed on the catapult around noon. I pulled the cord that released the valves and when the motor was firing properly Goodman released the catapult. The ship shot into the air, but the angle of climb became steeper and steeper. The films proved afterward that she had almost stood on her tail. The rocket motor was powerful enough to support the full weight of the plane for a few seconds, then the rocket ship crashed down.

We all thought this to be the end of the experiment, but the rocket motor was still in working order and the plane slid over the ice and took to the air for a second time. Then, in mid-air, the fuel supply gave out. The plane should have started gliding, but the wings had been damaged in the first crash so that they did not support the plane. A second crash ended the experiment.

The second plane took off from the ice without catapult. After speeding about fifty yards on the ice she lifted herself up only for about five yards and not higher than a few inches. Then she dropped back, slid for another thirty yards, and, with an even higher speed than before, took finally to the air, climbing to an altitude of about seventy-five feet, still increasing in speed. Then the air pressure on the wings became too great; the wings folded up and touched each other with the tips. But the ship continued to fly, even without the aid of the lifting surface of the wings.

Turning slowly around the longitudinal axis of the fuselage, the wings eventually came into a position where they were caught by the air resistance. They forced the plane downward, though the rocket motor was still working. The flight from take-off to crash had lasted exactly seventeen and eight-tenths seconds; the distance was approximately seven hundred and fifty to eight hundred feet.

These were the first experiments made with rocket motors for liquid fuels in airplanes. As far as the rocket motors were concerned, they have to be regarded as successful.

There were a few more important days in the past story of rocketry. The flights of the liquid fuel rockets constructed by Dr. R. H. Goddard in this country and by Johannes Winkler in Germany. There were the flights of Friedrich Schmiedl's mail rockets in the Austrian Alps. But these eight days strike me as of special importance. And one of them will later be called "the Beginning."

GUIDE TO SCIENCE KNOWLEDGE ANSWERS

(See Page 33)

1—Page 18 in A MONTH A MINUTE; 2—Page 34 in RED SHARDS ON CERES; 3—Page 52 in THE TENTH WORLD; 4—Page 67 in BEYOND THAT CURTAIN; 5—Page 91 in WHEN SPACE BURST; 6—Page 16 in A MONTH A MINUTE; 7—Page 40 in THE TENTH WORLD.

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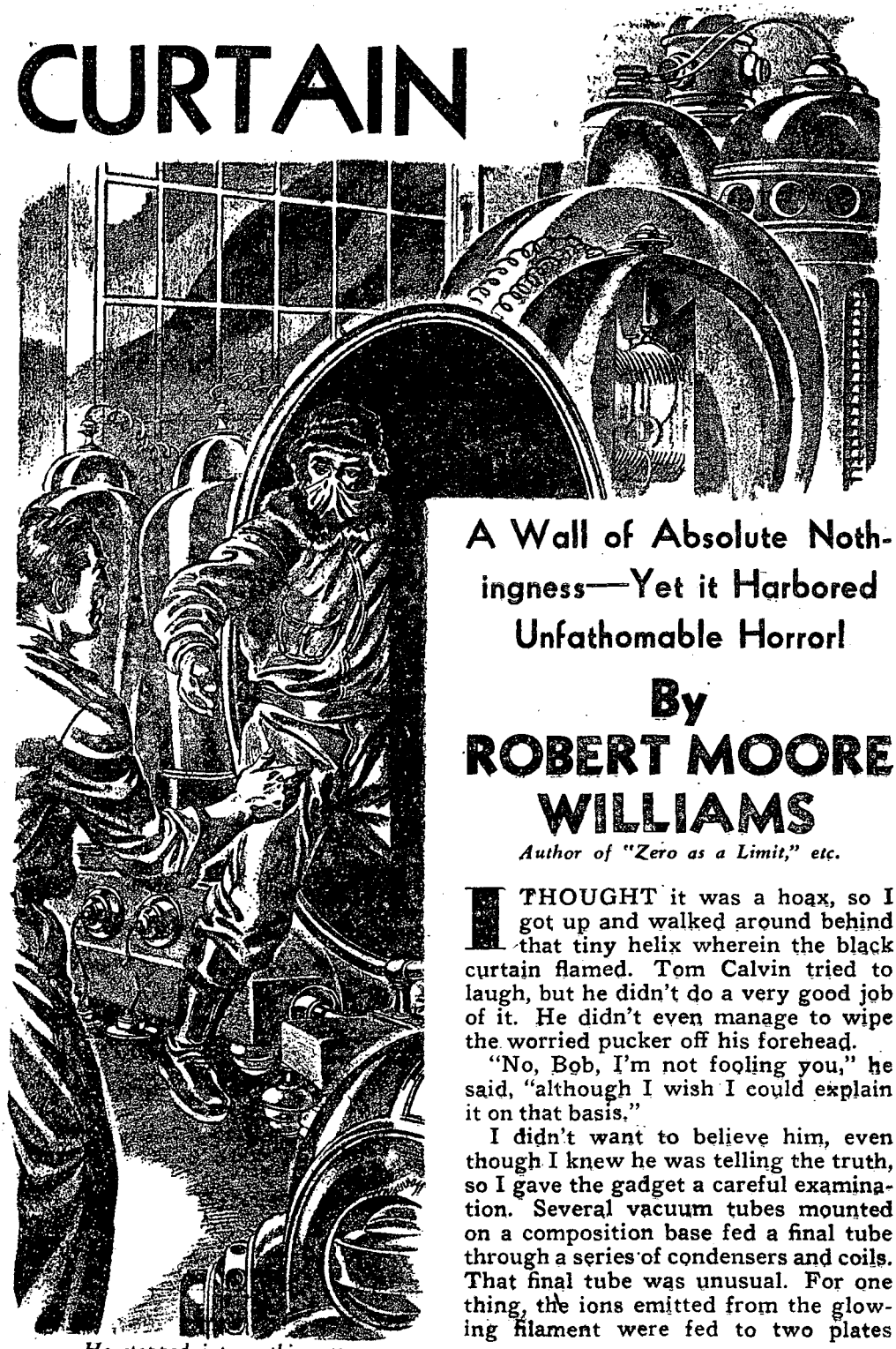
BEYOND THAT CURTAIN



He stepped into nothingness.

A Wall of Absolute Nothingness—Yet it Harbored Unfathomable Horror!

By ROBERT MOORE WILLIAMS

Author of "Zero as a Limit," etc.

I THOUGHT it was a hoax, so I got up and walked around behind that tiny helix wherein the black curtain flamed. Tom Calvin tried to laugh, but he didn't do a very good job of it. He didn't even manage to wipe the worried pucker off his forehead.

"No, Bob, I'm not fooling you," he said, "although I wish I could explain it on that basis."

I didn't want to believe him, even though I knew he was telling the truth, so I gave the gadget a careful examination. Several vacuum tubes mounted on a composition base fed a final tube through a series of condensers and coils. That final tube was unusual. For one thing, the ions emitted from the glowing filament were fed to two plates

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set exactly opposite each other; tiny circular grids forming tunnels down which the ions raced to the plates. The plates emitted a peculiar reddish glow as the ions hit them.

"That's the generator," Tom said. "The catch is that I don't know exactly what it is generating. I know what the equations say it should generate, but either the equations are wrong or our scientific guessers are in error as to the fundamental nature of the Universe."

"Yeah, I know. I heard you before."

I was examining the helix and paid little attention to him. The helix was a strip of copper tubing bent into a circle. It was perhaps six inches in diameter. The tubing was cut in one place and the plates from the final tube in the generator fed into the two ends of the helix.

In that helix the black curtain flamed. I know that something black can't flame, but this was black and it did flame. Tiny pinpoints of light flickered and wavered on that black surface. It looked like a million microscopic fireflies tangled in a chunk cut out of some midnight.

You couldn't see through it. I got up close and stared hard. Light didn't go through that place. But I got the stunning feeling that something else was going through, some subtle, inimical vibration that was far above hearing and probably above seeing. Something that the ears did not hear and the eyes did not see, that impressed itself on some unknown center in the brain. I stepped back.

"Did you feel it?" Tom asked.

"Yeah," I answered, leaning my arms on the laboratory table and staring hard at Tom. "What is it?"

"I don't know," he answered unhappily.

I glared at him in simulated disgust, but I wasn't disgusted. I was afraid. Tom Calvin had one of the keenest brains that old Mother Earth had seen in many a day, and when he said he didn't know the answers, there wasn't much chance of anybody else knowing them.

I pulled a pencil out of my vest pocket, a gesture I always make when I am puzzled. I work on a newspaper and I have found that pulling a pencil out of my pocket gives me time to think what questions am I going to ask next or is it time for me to beat it. Anyhow I pulled that pencil out of my pocket. In my upset mental condition I did not notice what I was doing until I had pushed that pencil into the black curtain.

NOTHING happened as far as I could tell. I pulled the pencil out and it looked as good as ever to me, but Tom, sitting on the other side of the table, almost had a fit. He shrank back in his chair and his face went white. That boy was scared.

"Did I do something wrong?" I asked.

He didn't answer me until he had gone to a closet in the corner and brought back a bottle and a glass. The label said it was bottled in bond and eighteen years old. He poured himself a stiff drink and set the bottle down. I had to ask him did he think I had gone on the wagon before he apologized and handed me the bottle.

"Take a good one," he said. "Then I want you to stick that pencil into that vibration field again. Stick it in several inches."

"Why? What happened?"

"I don't know."

I did as he requested. The pencil went into the curtain and came back out again. It was the best metal pencil you could buy for a dime, but Tom grabbed it from me and handled it as though it was made out of gold. He made a series of tests on it, using some apparatus he had on another table in his laboratory. He must have used acids because when he brought the pencil back it was no good.

"That will cost you a dime," I told him.

"It may cost me an awful lot more than that."

I gave him a hard look.

"Now tell Uncle Robert what happened."

But he didn't talk. Instead he took another pencil out of my pocket and, standing with his face directly over the helix, thrust the pencil into the curtain. I watched to see what he was doing.

On one side the pencil was going into

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the curtain but on the other side nothing was coming out. . . .

It was my turn to have a fit.

And yet, when he pulled the pencil out it was all there and worth a dime of any man's money.

Tom sat down. I pulled a chair up beside him and handed him a cigarette.

"Tom," I said, "I've known you a long time. We went through college together, roomed together, drank beer out of the same mug, made love to the same girls. You inherited a barrel of money and haven't done anything since we got out of school except play around in this lab. I've had to work for a living and so I haven't seen as much of you as I would have liked. But Tom Calvin, if you called me out here tonight just to make a fool out of me with some optical illusion, I'm going to paste you one smack in the snoot. Otherwise, for the sake of old times, tell me what you've got here!"

He twisted in his chair and continued fiddling with that pencil. He would screw up his eyes and look at it and then he would pucker up his forehead and stare at that helix. Then he would look at his generator and frown.

He shook his head.

"I wish I knew. You are probably familiar with recent developments in the field of physics and know that the mathematicians are getting away from the mechanistic interpretation of the universe that prevailed during the last century. Einstein started it. You have probably heard of the finite but unlimited Universe, the warping of space in the presence of mass, the space-time relationship, but have you heard of Ouspensky?"

I NODDED. To work on a newspaper you have to know something about everything. That's what they teach in college anyhow.

"Yes," I answered. "He's a Russian who took Einstein's formulae, and went on from there, expanding his generalizations to a conclusion that shocked half the scientific world. Then he proceeded to prove what the scientists claimed by branching off into metaphysics. Didn't he go nuts, or something?"

He was still frowning and still staring at that helix.

"I don't know whether he went insane. That's what most people would prefer to believe. You almost have to believe that, if you want to stay sane yourself. I managed to secure an original manuscript of his, something that was never published. I had the thing smuggled out of Russia and it cost me a small fortune. I learned the Russian language in order to read it. That wasn't as hard as it sounds, for the work was short and consisted almost entirely of equations with which I already was familiar.

"I took Ouspensky's equations and developed them. I learned them so well I could say them forward or backward, or start anywhere and go in any direction. Then I started to play with them, shift a factor here and another there, and study the result."

He scowled at the helix as though he would like to bite it.

"Those equations represented the fundamental picture of the Universe. They expressed, perhaps as accurately as it is possible to express, all that has been and that will ever be. The swirl of gas in the mighty nebulae lost in space and lost in time, the flight of the planets around the mother sun, the restless ebb and flow of the hot high tides when the earth was young, the endless dance of the atoms around their nucleus, the throb of life within the heart of protoplasm—"

"Now wait a minute," I interrupted. "Don't go off the deep end on me, and above all, don't try to tell me that the same equation that would picture the spiral nebulae would also explain what was happening in the fundamental basis of life, protoplasm."

"I said it, didn't I?" he replied heatedly.

"Yeah, but people say lots of things and don't know what they're talking about. However, go on. If I hadn't seen that pencil vanish and hadn't felt the vibration coming out of that helix, I'd have called you a liar long before. But go on."

"I studied those equations, shifting a factor here and a factor there." He hesitated and I wondered if he was talking to me or to someone else.

"It makes you feel like God. You

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shift a factor, and in your imagination there is a new heaven and a new earth."

I dropped my cigarette. I am only twenty-seven years old, but during seven of those years I have worked on a metropolitan daily and have talked to more than a few people. I have covered the night court and seen tough line-ups. I have interviewed a president several times and have talked to multi-millionaire bankers. I have watched two criminals walk the last mile. It's all in the day's work.

I dropped my cigarette. When somebody starts wondering about feeling like God, I start wondering about the booby-hatch. But Tom Calvin looked sane. I watched him closely out of the corner of my eyes. That same frown was on his forehead and he was still staring straight at that damned helix.

"OF course," he went on, "the Universe is nothing but a mass of interwoven vibrations. Matter, energy, all that exists, rightly understood, exists as a frequency, and may be interpreted by the science of wave mechanics. Out of my development of Ouspensky's equations, I built a generator to demonstrate my theory. Theoretically that generator should develop a frequency somewhat similar to cosmic rays. It should enable me to do something to the atom."

He paused.

"But something is wrong somewhere."

"Yeah," I said, "I gathered that."

And then I did it again. My purpose was good but my aim was poor. I intended to flip my cigarette butt over the table and into a sink against the opposite wall, but my flipper wasn't working right, and the butt hit that black curtain dead in the center.

It rang the bell.

The cigarette vanished. I wish I could adequately describe what happened. I earn my living by using words, and I thought I knew most of them and how they should be used, but when I try to describe that sound, I find I don't know anything. Maybe the words to describe it have never been coined.

A deep note, pure and sweet and clear, flooded the room. It sounded as if a mellow temple gong were ringing, a gong that was ages old, a gong that unnumbered years had purged of all defilement, only it didn't sound like that. Not quite. It sounded like a thin high note from a Stradivarius violin built against the background of a hushed symphony orchestra, only it didn't sound like that.

It throbbed like wood winds pulsing soft, sweet, and low, only no wood wind that ever man made sounded quite like that. Somewhere in it was the sobbing, rhythmic rumble of savage drums beating a reverberating tattoo in the jungle night under the hot tropic stars. Maybe it did sound like that. I don't know. I never heard savage drums, but in that note was something that made me think I had.

It sounded like a rumble of thunder during a spring rain, like the soft whispering of winds around lonely mountain tops, like the swish, swish, swish of waves along a sandy beach. It died in a sobbing whisper.

I don't know what the hell it sounded like.

Tom was sitting in his chair, that pasty-white look on his face again, so I knew that he had heard it too. I was glad he had. He saved me from thinking I had gone nuts.

"Bob," he whispered, "Did you hear that?"

I took a deep breath. "I sure did. What was it?"

He gave me a look of hurt surprise.

"I've been telling you I didn't know."

"But man," I protested, "you ought to know. You invented it."

"I evolved the equations and built the generator but I didn't anticipate that black curtain and I don't know a thing about it. I haven't the faintest conception of its nature."

"It looks like the hole I've often wanted to find, you know, the hole you crawl into and pull in after you."

"It does look like a hole," he murmured, turning the idea over in his mind. "There's a hole in Cygnus, a black spot that has puzzled astronomers for many years—"

He took his eyes off that damned helix long enough to look at me. I wished he hadn't, for there was in his eyes more of terror than is good for a man to see.

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"Bob—" he whispered, "Bob—I wonder if it is a hole."

I DIDN'T say anything. I had probably thought of the same thing he had. A hole has two ends. It does in this world, anyhow.

"Nonsense," I answered. "You've been looking at that black glow so long you're hypnotized."

He looked grateful, which added to my bewilderment. I could understand his fear, for the unknown has always terrified man, but I couldn't understand gratitude.

But he got back to that idea and stuck there like a leech.

"Bob, I wonder if my training in science has made me disregard the obvious. That curtain looks like a hole. I didn't notice that, but you did. The deduction to be made is—maybe it is a hole—"

"What difference does it make?" I was hoping he hadn't remembered that a hole has two ends.

"God, man, it makes too much difference!"

I should have known that his keen mind would not miss that point.

He got up from his chair and examined the helix again, fumbling with my pencil all the while, finally thrusting it against that black veil. It vanished little by little. Outside the black glow the pencil existed, very obviously a product of the machine age. Inside the glow it vanished utterly from sight. Tom thrust it almost all the way in.

His fingers must have slipped because the pencil vanished completely.

Tom jumped as though he had been shot.

"Did you see that?" he asked.

"Yeah, you dropped my pencil. That makes two dimes you owe me."

"Dropped, nothing! That pencil was jerked out of my fingers. Something grabbed it, gave it a sharp tug, and pulled it out of my hand!"

It was a hole, then. And it had two ends. One end was here in Tom's lab. The other end was—well you guess. That's what we did.

I picked up a test-tube, thrust it into the glow. It was jerked out of my fingers.

"Tom," I said, trying to keep my voice from quavering, "there's something alive on the other side. The things we thrust into this curtain don't vanish, they go through into somewhere, and something over there grabs them."

"That's the solution I've reached," he answered, thrusting a copper rod into the curtain.

A thought struck me that scared me out of my wits. We were pushing objects into somewhere, perhaps the inhabitants of somewhere could push objects back to us. Suppose they pushed a bomb through.

I acted without thinking. My brain ran off the track, but I was scared, and I grabbed the only thing I knew that would restore my sanity. I pulled the main switch that fed current into the generator. The black curtain vanished. Tom, a foolish expression on his face, was holding a copper rod in his hand whose end was neatly sheared off.

He stared stupidly at the rod.

"It's cut clean," he muttered, handing the rod to me.

There was no sign of fusion, cutting, or burning on the end. But it was as bright as a new penny.

"Why did you turn off the generator?"

"I got scared. Something might come bouncing back through that hole that would eat us alive. I'm still scared, if you don't mind my saying so." I poured myself a stiff drink.

"So am I," he answered, taking the bottle from me and pouring himself a drink that matched mine.

"Of what are we scared?"

"You're scared because you don't know what's happening. I'm scared because I'm afraid to guess. I might guess right, and I doubt if my sanity could stand it."

THERE is courage in a bottle. I took another slug of that whiskey. I poured another for Tom, and made him drink it. I didn't know whether there is sanity in a bottle, but it seemed a good idea to find out.

Tom sat down and cupped his head in his hands.

"Beyond that curtain lies another world, another Universe perhaps. Unguessed until now—unless what we have regarded as the addled thinking

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of certain mathematicians sprang from a source that they withheld—it apparently exists contemporaneous with and adjacent to the world of space-time in which we have our being. On the other hand, it may exist in the dim future or the distant past, it may exist out beyond Sirius or in the heart of a molecule, for we have no evidence to indicate what happens when an object passes through that hole.

"It may be a hole in space or time, or both, and the laws of our space-time may not—in all probability do not—hold for the world beyond that curtain. Matter energy, all that exists in our world, may have no meaning there. In that other world may be a new order. What to do—what to do—"

Perplexed, he paused. I had some things I wanted to say but for once in my life I shut up.

"If we announce this discovery—no, we can't do that. Civilization is not yet able to digest what may be behind the veil. No. There is only one thing to do."

"The only thing to do," I interrupted, "is to throw your equations into the fire, smash your generator, and devote yourself to golf."

He didn't seem to hear me.

"Is to go through. Yes, I shall do that. I shall see what is on the other side of here."

I laughed. It was the most out-of-place thing I ever did in my life.

"I've got a picture of you crawling through that six-inch helix."

"We will build a six-foot helix."

"Tom, don't be a damned idiot! You have no idea of the effect of that curtain on organic material. It might burn your body to a cinder."

He looked up.

"I had not thought of that. There is no point in committing suicide. We will have to test that. Excuse me for a moment."

He left the lab and I heard him fumbling around in his living quarters. He returned with a canary. Taking great care not to injure the bird, he tied it to a short copper rod, and closed the main generator switch. The black curtain leaped into existence. Wasting not a second, he thrust the bird into the veil, and as quickly drew it back. It was very much alive.

"You see?" he said.

I nodded.

"We will build a six-foot helix."

"Maybe you will, but not me. I have to earn a living."

"How much do you earn?"

I told him.

"I'll double it."

We had an argument, a hell of an argument. Eventually he won. I agreed to help him.

I didn't sleep well that night. An echo of the sound that had come from beyond the veil kept ringing and ringing in my brain. Somehow it sounded like a dirge. That should have told me what was to happen. But a man can't think of everything, and besides, I didn't know any higher math. Even if I had guessed the answer, I would have thought it was the whiskey.

I MOVED in with Tom the next day. He was an orphan, with no nearer relatives than a second cousin, and he lived alone, with the exception of a housekeeper, who minded her own business.

We went to work. The price Tom paid for some of the pieces of equipment made me weep, but he laid on the line without a whimper. When the specially made tubes arrived, I screamed in anguish at the bill. It seemed a mortal sin to spend so much money for a little tungsten and nickel enclosed in a vacuum.

We built the generator and the helix, turned on the juice, and there the veil was again, as black and as inimical as ever, and six feet tall. I wanted to wait, but Tom was impatient. He wouldn't even let me sling a dog through it, or a cat, not even when I told him that the greatest desire of my childhood was to see the Cheshire cat that vanished in such a remarkable fashion, the grin going last, if I remember my "Alice in Wonderland." I wasn't trying to be funny. I was whistling in the dark.

He dressed himself in heavy clothes, took a little water and food, fastened his oxygen mask under his chin, and stepped into nothingness.

That laboratory was suddenly as lonely as an island in mid-ocean. When Tom had vanished, I realized what a

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predicament I was in. I didn't even know how to repair the generator if anything went wrong, I didn't know how the apparatus functioned. I didn't know anything. He took all the knowledge with him.

I had asked plenty of questions while we were assembling the parts and he had answered as patiently as could have been expected, but most of the things he told me went over my head. If driven to desperation I could pursue through the quadratic jungle the wily X to his elusive lair, but calculus was only a word to me, and Tom had talked most of the time about things that started where calculus left off. In building the generator my job had been to fetch and carry, the strong back and the weak mind.

Tom didn't know whether he would be gone a minute, an hour, or an eternity. The answer to that wasn't in any of the equations he knew. He didn't know that he would ever come back. The canary had come back alive, but it had been tied to a rod that was connected with this side of the veil, and Tom wasn't tied to anything.

My job was to sit and watch, and maybe pray. I compromised on profanity, and an extra heavy snort out of Tom's bottle.

The second hand on my watch took an hour to get around the dial the first time, it took a day to make the second revolution, and thereafter its progress was measured in years.

Then that temple gong rang again. I wish I could describe that sound. Did you ever hear the mournful tolling of deep-throated bells sobbing and mourning in the dead of night? Did you ever hear the boom of a tall hall clock striking the hours from one until five? Or a gaunt hound baying at the gibbous moon? Or a great owl hooting in the deep north woods?

In that sobbing note was something that reminded me of all these. It whimpered and it mourned, it wailed and it cried. It pleaded, it cajoled, it threatened, then it begged. It vanished in a wild note that promised joyous ecstasy to come, and Tom Calvin stepped back through the veil, came from the hole through time or through space.

I was never so glad to see anybody in my life. I leaped from my chair, then caught myself, and quietly sat down again. I suddenly realized that maybe I was not so glad to see Tom Calvin.

Once I saw a man with the same expression on his face that showed on Tom's face. That man was sitting on the floor in a nut-house, carefully putting one small building block on top of another block.

PHYSICALLY, Tom looked all right, but I had a hunch that everything was not all right. He pulled off his oxygen mask, and in his eyes there was a flicker that looked like the tail end of a departing ghost.

He held out his right hand, which had been clenched, and opened it.

"This is Thoth," he said.

In Tom's hand lay a jewel. It was as big as an egg. It glittered with flickering lights from a thousand facets.

I didn't say anything. I didn't know anything to say.

He walked over and collapsed in the chair beside me.

"I could do with a drink," he muttered.

I spilled the whiskey. He downed the drink I poured him, and the one I took almost gave me enough courage to ask him some questions, when something happened that made me change my mind.

Tom started talking to that jewel.

"Thoth," he said, "it is time to do your duty."

The jewel blazed with ruby light, lifted out of Tom's hand, and drifted gently over to the generator, which was still functioning. It floated over and around the apparatus, and seemed to be studying it with an eye to having one made like it. I was sitting there with my mouth hanging open a foot, when out from that jewel there flashed a beam of blinding white light. It struck the final tube, and as it struck, the tube vanished. Quicker than I can write these words, the light flashed over the rest of the apparatus, over the helix, and whatever it touched vanished.

Then the damned thing came over and climbed into Tom's pocket.

"For God's sake, Tom, tell me what happened before I go nuts!" I screamed.

It took him an awful long time to re-

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member. He acted as though he were groping around in his mind, trying to tie together some loose ends.

"Happened? Oh, yes, you mean what happened when I went through the curtain. Nothing. Nothing happened. I just stepped through."

"Tom, if you value my sanity, tell me quickly. I'm on the ragged edge and I'm holding on with teeth and toenails. A man can stand just so much."

"Yes, I imagine you are. I'll tell you all I can. It won't be much, I'm afraid. They didn't leave me much to think with."

"'They!' What do you mean by 'They'?"

"Well, It, then. Doesn't matter which. Either It or They."

"Tom," I said, and there must have been a cutting edge in my voice, for he turned his head to look at me in a puzzled, hurt fashion, "what is beyond that curtain? What are 'They'? What is Thoth?"

"I'm doing my best, old man. I just can't think very fast. But I had better hurry, because I'm thinking slower every second. They said it would work like that. Even now my memory is getting hazy."

I took a fresh grip on my sanity and another shot straight out of the bottle, while he went on:

"When I stepped through that curtain I don't know whether I stepped a million miles in space, a million years in time, or through another dimension into another world that exists in the same place our world does, but in another dimension. There is no way of knowing, for no yardstick will measure the distance through that curtain. I stepped through, and into a universe of pure intelligence. We associate intelligence with the function of the mind. I assure you that in another universe intelligence exists independently of matter as we know matter, uses an energy system that I can't describe because we have no words for it, thinks in a way that we cannot think."

HE paused for a second and unconsciously patted the pocket holding the jewel.

"In short, the only way to describe that other universe is to say that it does not exist. Our senses cannot perceive it. Our intelligence can perceive it, and through the functioning of our minds we know of this other world—I mean we would know of it if we had stepped through that curtain—and in the same manner this other world knows of us. Nothing is in this other world, yet They are there. They have followed lines of evolution incomprehensible to us, are groping toward a goal that we cannot imagine, and have achieved a state of pure intelligence. They exist as a kind of space strain, a bulged bending of their space, and to them this space strain is matter; They perceive it and use it as we use matter."

He wiped the sweat off his forehead with a shaking hand. There was only one thing for me to do and I did it. That bottle was going down fast.

"My mind, or a part of it, is going, may be gone. I have a feeling that Thoth is speaking to you, through me."

"Who is Thoth?" I screwed up enough courage to ask.

"He is my guard. They sent him back with me, to see that I carried out my end of our bargain."

"What bargain?"

"Quit interrupting. I'm going as fast as I can.

"In this other world, the matter of our space-time is unnatural. It is a deadly poison to the inhabitants. When you flung that cigarette butt through the veil, you caused tremendous destruction. They walled off this section of their world, set a guard, and when I came through, They were waiting for me. They are intelligent to a degree that I cannot understand. My equations—"

There was an angry burring sound from the pocket where Thoth rested. The great jewel flashed out, flamed across the room. Tom's desk, littered with page after page of scrawled equations, including Ouspensky's work, vanished in a white flame. Thoth came back and climbed in Tom's pocket.

"I forgot about them," Tom muttered.

"Go on, man," I urged him.

"When I came through, they were waiting for me. They were afraid, and were about to destroy me. They would have destroyed me if I had not bar-

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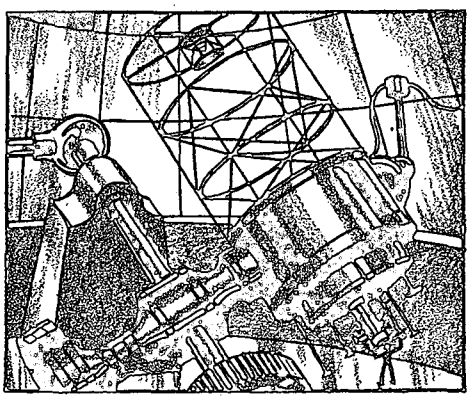
gained with them."

"In exchange for my life, I agreed to destroy the generator of the curtain. In order to make certain that I did not menace them again, They took from my mind all knowledge of mathematics. Don't ask me how it was done, I only know They did it. And They sent Thoth back with me, to destroy the generator, to live with me as long as I live, to be certain the bargain is kept.

"Well, it will be kept—" He fainted.

IN the field of biology the name of Tom Calvin is now famous. But his associates regard him as eccentric and possibly superstitious, for he always carries a piece of cut glass in his pocket.

Physically, he is as good as ever. He plays a walloping game of golf. He beat me yesterday morning, shooting a 78 over a rough eighteen holes. I know he shot a 78 because I kept the score and counted his strokes. He can't add two and two.



IN THE NEXT ISSUE

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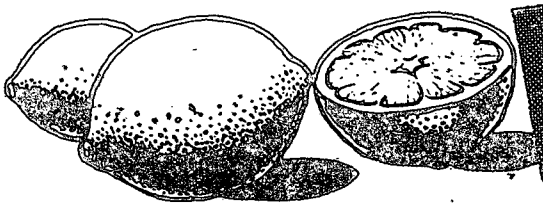
ZONES OF SPACE, a Novelette of Lost Atlantis, the Sunken World, by MAX C. SHERIDAN

LEMONS HAVE AN



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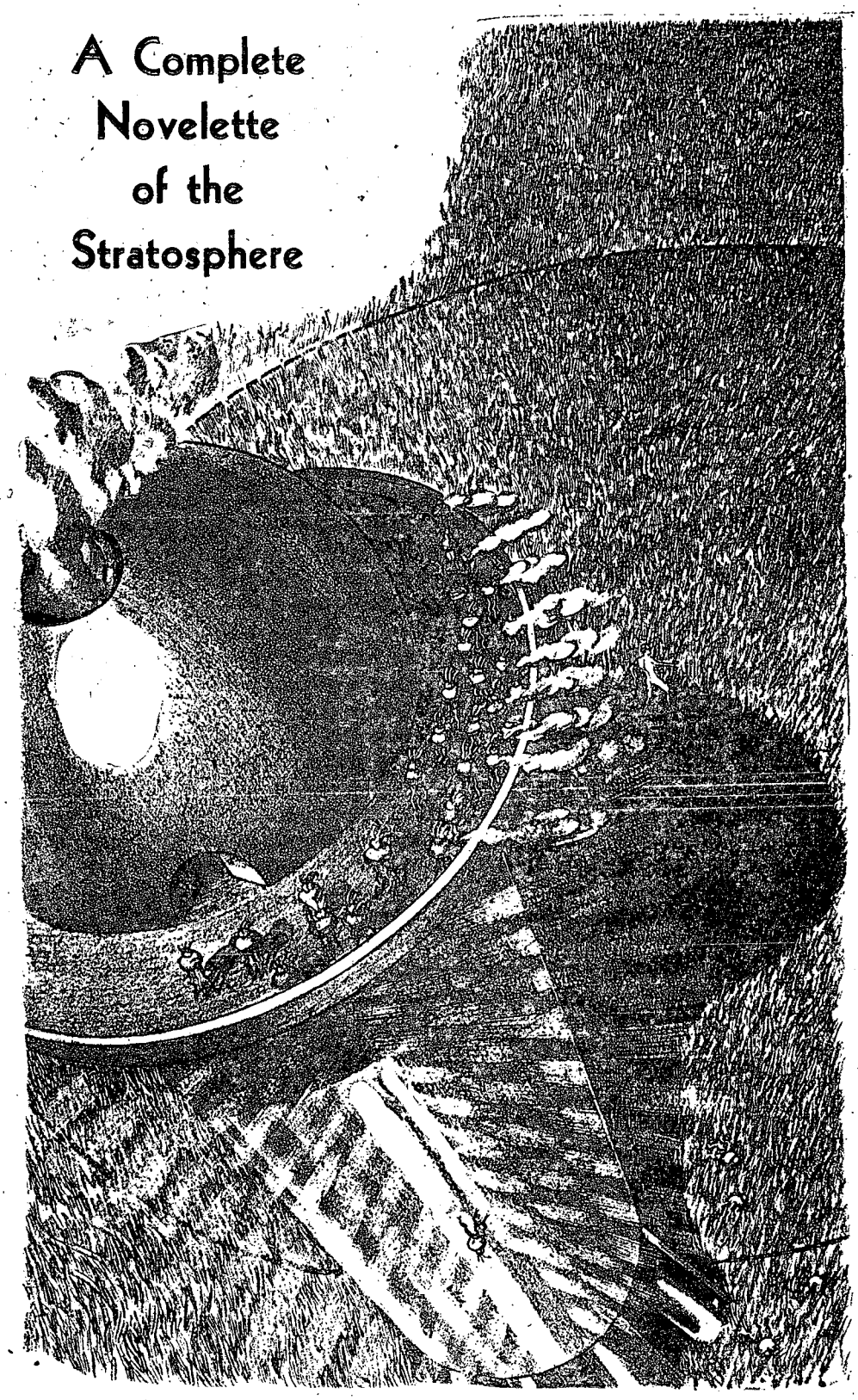
A Complete Novelette of the Stratosphere



A halo of red streaks surrounded each turret

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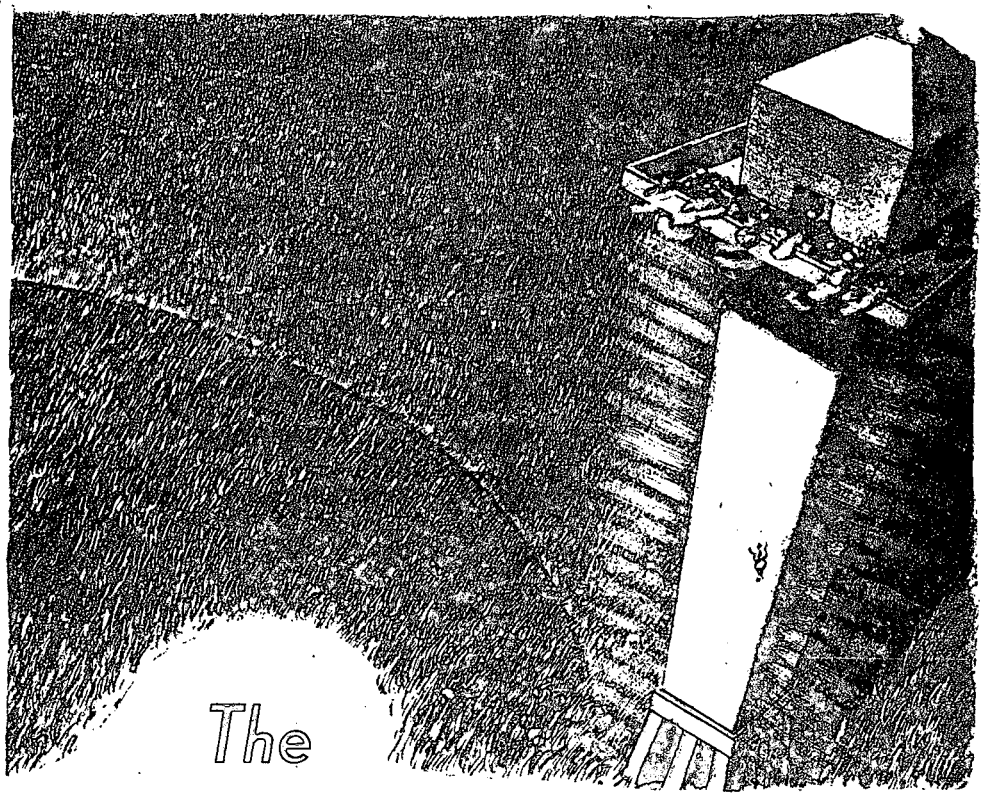

The MIND MAGNET

Mighty War-Engines, Controlled by a Race of Alien Thought-Thieves, Roam the Planet of Eternal Strife!

By PAUL ERNST

Author of "Protoplasmic Station," "Rift in Infinity," etc.

CHAPTER I

The Trial of Professor Stillwell

TWO men stepped into that stratosphere balloon. One was Professor Stillwell, the other was Commander James Farman.

Thirty-eight hours later the balloon settled to earth in North Carolina in the midst of a crowd drawn by the sight of its descent. Only one man stepped out. That one was Stillwell. Farman would never step anywhere again. He lay inside the duralumin ball.

Dead, they pronounced him at first, for his heart was not beating and no film showed on any polished surface held before his lips. Then came the great mystery, brought on by the embalmer who thought the corpse wasn't quite normal and insisted upon more exhaustive tests.

Commander James Farman's body was lifeless. And yet it was not dead! Not according to the ultimate tests of the physiologists.

Cold and stark that body lay. Yet its blood was not coagulating; the muscles were not stiffening, and never did stiffen, in rigor mortis; and there

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was no least sign of decomposition over the months in which the lifeless flesh was observed.

Dead, but not dead! An impossibility. You may have read in the papers of the exhaustive questioning of Professor Stillwell. Here was a man who had been cooped in a ten-foot metal shell with Farman during the whole ascent of the balloon. If any one should be able to explain Farman's horrible, undead state, it should be Stillwell.

But Stillwell's explanations only replaced impossibility with sheer lunacy. You didn't read his account in any of the newspapers.

They don't print such stuff. However, he is dead now; and his statement, for what it may be worth, can be reproduced in this scientific journal.

(June 12th, 1939, Asheville, North Carolina, written and sworn to before coroner's jury investigating the apparent death of Commander James E. Farman. Shorthand transcription of testimony of Professor Walter Still-) well by clerk, Abel Whitehouse.)

WE started at dawn of June 10th (Professor Stillwell begins) from New York City. The ascent was made from the New York World's Fair Grounds. There was a great crowd around in spite of the early hour. This was most annoying, but as our ascent was financed by the Fair, we had to submit to being a side-show attraction.

At ten minutes of five in the morning we stepped into the metal ball beneath the tremendous, straining bag of the balloon—Commander Farman and I, dressed in heavily padded suits. We must have been quite a contrasting pair. Farman is, or was, a powerful man of thirty-four, over six tall and solidly built. I am nearly sixty, small, and not strong.

Farman shut the curved door, there was a great cry from outside, and we began to rise. The mountainous bag bore us up smoothly as I valved sand from the space between the floor and the curved bottom of the ball. From the bottom of the bag our metal sphere hung like a pea depending from the stem of a pear.

The ball was checkered, with alternate squares black and alternate squares white. The black squares were to absorb heat from the sun in high altitudes so that the interior of the ball would not be too cold.

(Interjection from jury foreman: "Please keep to the matter in hand, Professor Stillwell." Answer: "Very well, gentlemen, I will start with our peak altitude, which was eighty-four thousand feet.")

All our apparatus, for the measurement of intensity of cosmic rays and so forth, was functioning perfectly. But we were unable to observe the heavens. The sky at that high altitude, as you know, is like deep black velvet, with the sun a big white ball. But we were unable to see it because the glass traps in the top of the ball had become frosted over. We had electrical defrosters, but when we had beaten all altitude records at seventy-eight thousand feet, we discarded our heavy batteries in order to rise still higher.

Commander Farman suggested that he open one of the traps and wipe the glass clear. This was done, quickly, because in that rarefied atmosphere we swiftly lost air from our tanks. Farman resumed his seat on the floor, with neither of us even remotely aware of what had happened while that trap was open. . . .

SUNLIGHT came sharp and clear through the square of glass. I watched it idly, and saw that in the sharp, clear beam were floating specks of dust. Brought up with us, of course. At that height, dust specks are rare.

Some of the flecks stayed steadily in position. Some danced and eddied. Some gleamed momentarily blue or green or yellow as infinitesimal prismatic reflections were struck from them in their turning. Some glowed amethyst or gold.

But one speck, slightly larger than the rest, shone a brilliant, ruby red.

My eyes, caught by the red speck, focussed idly on it. The first thing I

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noticed was that the red color did not vary. The other specks in the beam changed color as they turned. This fleck stayed rich red consistently.

I have been accused of self-hypnotism by the few who have already heard my statement. But this cannot be true. For I stared away from the red speck after only a minute or so, to look up at the velvet black sky through the glass which Farman had been kind enough to wipe clear.

It was while I was staring up through the glass that I felt, suddenly, a curious breathlessness. I heard Farman exclaim, and then was blinded by a reddish glare. My eyes sought the source. The glare came from a ball about as big as an orange which floated in the beam of light where the red dust fleck had been.

A ball the size of an orange? It was growing, swelling. It became a thing a yard in diameter, then, swiftly, a sun that filled the metal shell from wall to wall. A gigantic, fiery sun that blinded me.

Then something terrific happened to my body. Every atom of my being seemed to be flying to bits. My head felt as though it were noiselessly exploding. I tottered on the floor, panting for breath.

The glaring sun, and everything else in the shell, faded into blackness. . . .

You know how a smashed finger feels? How it throbs and quivers to every beat of your heart until, if you could, you would be almost glad if your heart stopped beating? That was the way I felt all over when consciousness returned to me.

My whole body ached and throbbed to the thud of my heart as though I had been smashed repeatedly with a hammer. The agony was unendurable. I think I would have gone mad if it had lasted long. Fortunately it didn't. In a short time it stopped and I was able to sit up, weakly, and try to find out what sort of seizure I'd had.

The first thing I noticed was that I was bare. And it was while I was fumbling dazedly around for my clothes that I made the second bewildering discovery.

I had lost consciousness in the shell of the stratosphere balloon. But I had not regained it in the same place. In horror and amazement I stared around.

All about me was open plain, like a prairie, covered with waist-high grass that was reddish in color.

OVER my head was a cloudless, glaring arch of sky that was not blue but light, angry red. Bathing my body and the bizarre prairie was a reddish flood of light that came from all directions at once instead of from a central sun.

"I've gone mad," I mumbled to myself.

At that instant an ear-splitting scream penetrated into the confusion of my thoughts. It came from some point over the horizon and sounded like a factory whistle gone crazy. Incredible that it should come so piercingly to my ears and yet be far enough away to be out of sight over the bend of the horizon.

But then I noticed that the horizon was oddly close to me. On all sides, a ring of red sky met red ground, dipping down like a great cup. Had the world we know been reduced to a ball several hundred miles in diameter, the effect would have been the same. And this queer fact confirmed in my mind a conviction that I could no longer deny, no matter how mad it seemed.

I really *was* in another world. However in God's name it could have happened, I had lost my senses in Earth's stratosphere—to regain them in another and weirdly different sphere!

Another high-pitched, distant scream cut short the thoughts churning in my mind. Involuntarily I crouched low in the waist-high red grass to hide myself. As I did so, an answering scream ripped out from the distance behind me. A high, hissing bellow, like the cry of some gigantic animal.

Again the scream sounded ahead of me—to be echoed instantly by one from behind. The latter cry was pitched in a different key, so I knew it was an echo.

The solid ground beneath me began

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to tremble slightly. Carefully, fearfully, I raised my head until I could see above the grasstops. I gazed in the direction of the first cry.

Up over the rim of the horizon thrust something that at first looked like a moving lighthouse. It had a thick central turret, with a wide, overhanging balcony surrounding it. This balcony, I could see, was thronged with moving small figures. People? Human beings? No, even at that distance I could sense that the things on the balcony were not humans as we know them.

The moving lighthouse was rearing colossally as it neared me. Up and up it loomed over the skyline. Now I could see that the shaft of the tower was not solid all the way down. The bottom of it was split into thick, jointed columns which served as legs. A dozen of them, there must have been, moving regularly as machinery moves, bearing the great structure rapidly nearer. A tower a hundred feet high—like a tapered lighthouse walking on a dozen jointed legs.

By now I was able to see plainly enough to verify that the tower was a mechanical, not a living thing. It glittered with a hard metallic sheen in the angry red light. As the many legs moved I could hear a savage clanking. Metal on metal with the moving of sheathed joints.

The things on the armored turret were waving curiously boneless arms, or tentacles. Excitement seemed to prevail. A frenzied, ferocious excitement. It came to me that these creatures, whatever manner of life they might be, had built an enormous destructive engine to ride on—a machine of war.

Once more the shrill scream ripped out. It was followed by a puff of greenish vapor from the metal cap of the big turret.

The answering scream from behind came so near that I could feel the hairs on my scalp crawl with the vibration. I looked over my shoulder.

There, a second tower had appeared over the sky-rim. It was about the same in construction as the first, but it was built on square lines instead of round. It too had a turret crowded with gesticulating creatures. It also rushed over the ground on many legs, as though eager to meet the other in titanic combat.

CHAPTER II

The Red Planet

I AM not giving my thoughts, gentlemen, because at the time I had no thoughts. I was dazed. I had been fantastically hurled into this mad scene in some manner that defied sanity, and I could only feel.

My feeling told me surely that these two things were hurtling into battle. There was no mistaking it. Manned by creatures of two opposing forces, if the varying architecture of the towers meant anything, they housed two armies in moving metal. Two armies about to clash. This planet, red as Mars, was a planet of perpetual war and death!

Fearfully I watched the round tower, as it was nearer to me. On it rushed, straight toward me. But suddenly it stopped short. And with that stopping I noticed something that until now had only vaguely caught my eye.

Around the spot in the reddish prairie in which I had hid, was a line as evenly drawn as though traced by a gigantic compass. The circle was about a hundred yards in diameter, and I seemed to be approximately in its center. The line, running evenly through the grass, glistened in the red light like a path of metal.

The round tower had stopped at the very edge of this circle. A few seconds it teetered there, then it drew hastily back, as if the circle were a charmed or deadly space. Its ear-splitting scream shrilled forth, while an answering scream from the square tower sounded on a note almost of frustration. As though the round tower had nearly been trapped in some way, and had managed to escape.

For the one instant of its nearness to the circle, I felt again the same

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nausea and terrific tension of body I had experienced just before being transported somehow to this small, red, warlike globe. But the faintness passed—as if some tension in the ground beneath me had been turned off, and I was again concerned only with watching the monstrous towers —and with keeping myself out of their sight.

The round tower rushed around the prohibited circle and at last was within a few hundred yards of the square tower. Both towers halted. I saw the tiny creatures in each fighting turret squat below the parapets, and then I saw flashes come from each balcony as if the two crews were armed with guns and the flashes were rifle shots. No sound accompanied these flashes. There were only flame-streaks, deeper red in the red light from the close-arching heavens.

That the discharges were deadly, I could see at once. On each turret figures threw up coiling arms, and sank out of sight behind the parapets. A few fell over the railings to sprawl in space like wounded insects and crash sickeningly to the ground over a hundred feet below.

The battle was too fierce to last long. A bristling halo of red streaks surrounded each turret constantly. Soundless as the shots were, an explosion splashed the legs of the round tower with fire. Two of the legs dropped off, causing the tower to list badly. It withdrew in crippled haste, with the square tower after it.

The square monster whistled piercingly, a sort of cry of triumph, and disappeared over the skyline after the other. I uttered a sob of relief that these terrible things were gone, and started to get to my feet.

TURNING, I saw Commander Farman. Twitching and trembling, afflicted by the aftermath of change that I had gone through myself, he sat up and looked around. Either he was quicker of intelligence than I, or, being younger and less foolishly skeptical concerning things usually held to be incredible, he was more willing to place credence in the testimony offered him by his senses.

"Another world!" he mumbled, with awe in his tone. "We're on another planet! But where—and how—"

I took a deep breath and tried to get at some sort of explanation.

"You were with me when I was—whisked—here, and you seem to have come after me. Tell me, did I just disappear out of the shell, or what?"

"You were still there when I fainted —or whatever it was happened to me," Farman said. "I saw you staring at a red ball floating in the sunlight. At least it seemed to be a ball. Then you stiffened, and fell full length on the floor. I went over to you and tried to bring you to, but you were deeply unconscious. In fact, I thought you were dead. I started to valve the balloon to bring us down—and then I keeled over myself. Now I'm here."

I shook my head.

"How could I be back there unconscious, and here too—wherever here is?" I mused.

There was silence for a moment, and then I went on with a queer train of thought. I don't know yet whether it was pure theory or fact.

"But perhaps only my body is back in the stratosphere shell. Perhaps it was my mind, my thought, that was wrenched to this place, leaving the body a tenantless shell."

Farman doubled his big fist.

"There seems to be something here beside pure thought," he shrugged.

"But perhaps," I said, "in this curious plane, thought becomes person as well as personality. Thought is presumed to be electrical. So, in the last analysis, is matter. Perhaps our minds have taken on form again here —the form familiar to us on Earth, after being wrenched from our bodies."

Suddenly, a dozen yards away, a trap door opened in the ground. It had been cunningly concealed, sodded over with the red prairie grass so that I hadn't dreamed of its existence before. Now it was thrown wide, and in the opening it revealed were two creatures that might have stepped straight out of a nightmare. I can see them yet.

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They were about four feet tall, and moved on three many-jointed legs like those of insects. Like insects their legs and globular bodies were protected by a sort of chitinous natural armor. Only their legs and heads were not sheathed by the stuff. Their arms—three boneless tentacles ending in three coiling "fingers" apiece—weaved about like the tentacles of devil-fish.

Their heads, round as beads, were set directly on the globes of their bodies; and there were no features. The heads were simply round sacks with three eye-tipped tentacles pronging from them.

FOR a few seconds they remained in the opening. Then they started toward us. We could see now that in the center tentacle of each was what appeared to be a short piece of very thick wire. The wires were levelled threateningly at us.

"These things mean us no good," muttered Farman. He drew closer to me. Together we braced ourselves to meet the attack of the nightmare things.

"Stand a little behind me," directed Farman. "I'm bigger than you."

It was true enough. He was half a foot taller than I, eighty pounds heavier, with cordlike muscles on his heavy torso and limbs.

He seemed more than a match, alone, for the two reddish-black insects, or whatever they were, that came near with their antennae turned toward us and their dull eyes staring with cold intelligence.

On they came until they were almost within our reach, their icily demoniac eyes glaring balefully. Farman crouched and sprang—

He dropped at the clawed feet of the nearest Thing. And it seemed to be some discharge from the thick wire that had made him drop.

The next moment, before I had time to gather my wits, the other creature jabbed its wire at me.

That was all there was to it. For the second time within an hour I lost consciousness—but this time instantly, as if I had been struck by lightning. There had been little enough to the fight.

And now we were in the power of these Things with three chitinous legs and three slimily coiling arms and three cold, hellishly intelligent eyes that waved on foot-long antennae.

CHAPTER III

The Thought Thieves

THE next time I struggled back to consciousness, it was to face surroundings even more bizarre than I had the first time.

Farman and I lay in a large room. It was evidently underground for there were no windows in the walls. It was illuminated in some concealed way by the same clear red light as that which took the place of sunlight outside.

All about us was intricate looking apparatus—laboratory apparatus most certainly. Great, twisting coils of metal; odd machinery; huge, serried cylinders like electric coils; metal containers of all shapes and sizes that, we saw later, were filled with varicolored fluids.

This I had time to observe. And I had time to hear Farman's moan of returning consciousness. Then one of our ghastly looking captors teetered on its skinny, chitin-covered legs around from behind a monstrous coil, and approached us.

This Thing was not one of the two that had attacked us on the ground above. It was smaller than these, less vigorous in movement. It bent fearlessly over us, and I thought I saw perplexity in the cold eyes so fantastically set in the end of three foot-long stalks. Was it amazed at our conformation, so different from its own? Or was it simply considering how best to kill us?

"Shall I try and smash the Thing?" asked Farman tensely.

But at the sound of his words, the strange creature stepped back. It made no sound itself—indeed, there

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seemed to be no mouth or other opening through which sound could come. But it evidently heard sound quite well.

"Wonder what it intends doing to us?" said Farman, rising to his feet. He clenched his big fists. "What a nightmare this all is—"

A quick move of the great insect—for I still think that's what it was—made him break off. The three-legged creature had stopped watching us as though we had suddenly ceased to exist. It teetered to a small plate of metal set into the sidewall of one of the great cylinders. This it observed closely, as though it were a gauge and something might be read in it. And, indeed, there *was* something! We could see that ourselves.

Light. Rippling in waves over the metal as though trying to tell a story.

Simultaneously both Farman and myself felt the ground quake.

"One of the towers—it's coming back!" yelled Farman.

Breathlessly we watched the great insect—a competent scientist, we judged—if you could call such a creature by a human term. With equal tensity it glared at the rippling light on the plate, which was growing ever stronger now. One three-tendriled "hand" went out to a crooked lever extending from the coil beside the plate.

Then the earth tremors subsided; the rippling light died on the plate; the tower was going away again. With a gesture that surely indicated disappointment, the Thing turned away from the lever.

FARMAN walked toward it. The creature stepped back on its three clattering legs, whipping up one of the thick wires from a nearby stand. Farman smiled placatingly and slowed his pace. The Thing lowered its weapon but stared warily out of three icy, malevolent eyes.

"The Thing doesn't look definitely hostile," Farman said to me. "I'm going to try to warm up to it."

He stopped, and smiled again. He bent down and went through the motions of drawing diagrams on the floor. A hopeless maneuver, I thought. But it was not hopeless. With a really wonderful quickness of intelligence, the giant insect caught the meaning.

It went to a corner and returned with a piece of soft reddish rock. Farman tried it, and it left a mark like red chalk on the floor.

"Smart," breathed Farman. "We'll see how far its brains can go."

He crouched and applied the chalk to the smooth floor. He drew a tower—a round one, and looked up questioningly.

The response was immediate and violent. The Thing snatched the chalk roughly away and drew a square tower.

"We've been caught by the army of the Squares, or whatever they call it—and there's plenty of patriotism on both sides," said Farman. I nodded, feeling as I had all along that I moved in a dream.

Farman gazed at the Thing, pointed at the round tower he had drawn, and looked puzzled. The creature caught the thought instantly—so quickly that I divined a bit of thought reading along with the pantomime. The fact that these Things seemed to have no way of making sounds indicated mental telepathy.

It pointed upward toward the prairie over our heads. Then it drew a large circle on the floor. Finally, into the circle it introduced a round tower. It rubbed this out instantly with a savage sweep of a boneless arm, and waved its three tentacles upward.

"Do you see?" Farman said excitedly. "A tower comes into the circle and is somehow made to vanish off the face of this planet. Is thrown clear away from it. But how, I wonder?"

As though reading his mind, though it may simply have been going on with the gestured account, the Thing pointed to the crooked lever set in the coil. It went through the motion of pulling the lever far forward. That was how it was done, the movement said.

Farman swung toward me.

"Do you see?" he almost shouted. "Do you see? That's how we got here!"

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What did he mean?

Farman explained his idea rapidly.

"The strange repelling coils connected with the lever and working through the great metal circle outside did *not* destroy a tower unfortunate enough to stray into the wrong spot," he pointed out. "It simply cast it forth into another sphere. Conversely, if the lever were pushed in the opposite direction, beyond the neutral point, it might perhaps set up a reverse action and *attract* objects—pull them from outside into this sphere."

MEANWHILE, with that lightning-quick mind it seemed to possess, the Thing appeared to have thought to the same conclusion. It stared at us, at the lever, at the diagram on the floor, with its cold, malignant eyes glittering dully.

It teetered to the lever, made as if to push it in reverse, then stopped with its three tentacles writhing in what appeared to be indecision and perhaps awe.

But if our theory was correct, how had the great mass of our bodies been brought to this small globe? Well, from Farman's story, they hadn't. Our bodies were apparently back in the stratosphere shell. Only our minds, our consciousness, seemed to have been brought here by those relatively mighty coils, and then have been materialized again into our Earthly likenesses by some mysterious alchemy.

But now our minds became occupied with speculations less abstract—and more momentous. What were our fantastic captors going to do with us?

That, in addition to some basic facts concerning this small red planet, was divulged gradually to us by gestures and the use of the bit of chalk. I won't take time to describe the ingenious sign language evolved by the Thing to make its meaning clear; I'll simply give the result.

This compact little globe had been scarred by war as long as it had had life. Constant war! Half the population against the other half. The towers were the latest fighting engines. Each side had about a hundred; one hundred square against a hundred round.

The repelling circle was a new invention. So new, indeed, that some of its latent possibilities, like the peculiar action resulting from the reversal of the lever, had not yet been learned. It seemed to offer an end to the ceaseless warring by giving victory to the square-tower forces.

However, the Squares overlooked no chances. Our strange appearance here had given the scientifically trained bug before us a grim idea. Startlingly alien and different as we were, wouldn't we be able to penetrate enemy territory? Our weird (to it) appearance had intrigued its attention long enough to save our lives. Wouldn't the same thing happen with the enemy?

Apparently the Thing thought it would. Whereby a plan had grown in its cold brain—a plan that was fine for it but rather ghastly for us.

We were to wander into the Round encampment, where we would probably be received under guard, but left alive as curiosities. Once there we were to blow up their stronghold with explosives hidden in the hem of a sort of loin cloth, which we were handed.

What would happen to *us* in the explosion? This was something that obviously concerned them not at all.

I shook my head frantically as the meaning of the diagrams became clear. Farman stood straight and defiant, arms folded across his chest.

"They can go to hell," he said. "Walk into an enemy camp and blow ourselves to bits with it just to help them win this senseless war? Do they think we are fools?"

THE words, of course, meant nothing to the Thing. But our defiant attitude was plain enough. Its three dull eyes glinted malignantly. It went to a flat bench, like a table. On this were several cubic metal containers. It opened one, thrust in a coiling tentacle, and drew out the most repulsive thing I've ever seen.

It was a gigantic insect, nearly a foot in length, covered with coarse, black hair. It had three sets of horn

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pincers, which clicked ferociously in empty air as the Thing held it carefully behind its round, ugly head.

Several of these things, we were given coolly to understand, would be allowed to feast slowly on our living bodies if we refused to obey. We had our choice. Instant death, blown to bits by powerful explosives—or slow death as our living flesh provided food for these terrible insects.

Farman's jaw squared. He glanced at me. I nodded. I fear death as much as any man, but I prefer it quick, if it must come.

The Thing seemed to give out some soundless call. A panel in the wall opened and four more of the great, chitin-covered Things teetered into the laboratory. Two of them bore metallic-looking squares of fabric, and two carried gingerly two small packets of tubes that looked like firecrackers. The tubes seemed to be made of metal, however, and had no fuses dangling from their tiny ends.

While the tubes were being folded into the cloths, and these being twisted into thick strips, like belts, we were given our orders.

We were to walk up to the enemy stronghold, which was only a short distance away, and let ourselves be captured and taken to headquarters. There we were to blast that section of the red planet out of existence by simply slipping off the belts or loin cloths and dashing them, explosives and all, to the ground. Evidently horrible power lay in the tiny, firecrackerlike tubes.

Sure death, of course, if we followed the command. But we had no intention of obeying.

The trapdoor was opened. We were thrust up onto the prairie surface—two human beings in a world of creatures such as no human had ever seen before, bearing death for hundreds in the folds of our loin cloths. The four Things came with us. One pointed with its middle arm the direction we were to take.

None of the moving towers was in sight. Nor was there a sign of any of the Things moving in the waist-high grass. Seemingly this was a deserted planet. Probably all on it lived under its surface, driven there by the centuries of ceaseless war, the very cause and reason for which were now forgotten. But if so, how could we find the headquarters we were supposed to destroy?

"We'll find it soon enough," grunted Farman. "We'll be captured—or killed—before we get very close to it."

We glanced at the four monstrosities which guarded us, each with its deadly wire on us, and then started in the direction indicated. On and on we plodded, ears alert for one of the terrific, whistling screams that might indicate a tower nearby. But none was heard. The prairie seemed lifeless.

AND now, with the hidden laboratory at least a mile behind us, I thought to put into execution the idea I had conceived before we set out.

"Why not just leave these loin cloths, explosives and all, lying harmlessly here in the open fields?" I said to Farman. "Then we'll go on as planned, get captured, but try to convince the other side that we're harmless. If necessary we can pretend to be willing to fight on their side. That way we'll live a while longer, even if we accomplish nothing else."

Farman nodded and stopped. We peered around. No sign of life broke the unending surface of the sea of red grass. We took off the belts.

Almost at our elbow rose one of the four Things. Silent as shadows, having practiced all their lives at moving invisibly through this prairie grass, they had trailed us to prevent this very move. Evidently they meant to keep us in sight until we were actually in the hands of the enemy.

At a menacing sweep of the Thing's wire, Farman and I put the cloths back on. Hopelessly we started again toward the unseen enemy encampment. Beside us and behind us we could hear, now that we knew we were still guarded, occasional faint rustlings in the grass.

I think we must have covered six miles when abruptly we heard the

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thing we had been dreading: the earsplitting shriek of one of the towers. A round tower, we saw, as it thrust itself over the horizon and rapidly approached us.

Straight toward us the thing came. We cowered down in the grass, but at a prod from one of the guarding Things, we stood up again so we could be seen. The tower got so close that we could distinguish individually the nightmare denizens of this planet that stood in the fighting turret. And then it was directly over us.

CHAPTER IV

Return to Earth

WE stood in the very shadow of the tower with our eyes closed, waiting for death.

(Interjection, jury foreman: "This man is a well known scientist, but his story is so unbelievable on the face of it that I think we should halt it here and now. Also I move that he be examined by the psychiatric board.")

(Protest by three members: "Let him finish, with a warning that he faces mental examination if he persists in telling of things which could not possibly have happened.")

(Professor Stillwell: "Gentlemen, I can only tell the truth, as God hears me, about what occurred to Commander Farman and myself in the stratosphere shell.")

But death did not come (Professor Stillwell resumes). The Thing in the laboratory had reasoned correctly. Our bizarre appearance, the obvious fact that we were absolutely alien to the planet, kept the Round forces from instantly killing us.

A sort of scoop lowered swifty from the turret. It swooped on us like a bird that was all jaws. If we had tried to, we could not have run fast enough to avoid it. In an instant we were engulfed in it and were being swept up to the turret, ten or twelve stories above us. There, it opened and spewed us out.

Dozens of the Things, identical in form and appearance with the Things that had sent us to destroy them, surrounded us in a circle, staring with their three eyes moving on the foot-long stalks that supported them—and with their weapons, more of the thick wires, unanimously trained on us. Then there was a silent stir in their ranks and the tower galvanized to life.

"Shouldn't wonder if our four guards have been spotted," Farman said. "If so, they'll pay for following orders so implicitly!"

The tower moved faster, rushing forward for a dozen quick though ponderous steps. Then it stopped, and though we could not see the result, we could guess it.

In the blood-red grass below, pulped under the metal feet of the tower, would be four shapeless blobs that had once been chitin-covered intelligences.

Interest was transferred back to us.

"If they search us—" breathed Farman.

The discovery of the tiny tubes of explosive would mean our instant death, of course.

Several of the Things drew near, coiling arms weaving cautiously toward us. Farman held up his hand, palm out.

"Just a minute!" he barked.

The words, of course, meant nothing. But the gesture stopped the Things. Once more Farman went through the motions of wanting to draw pictures on the floor.

This time it took longer for his meaning to be grasped; but eventually it was. One of the surrounding horde produced a sharp piece of metal and handed it to Farman. He stooped with it. Again there followed a passage of gestures, and of diagrams scratched on the floor.

FARMAN pointed to us and then to the heavens, telling that we came from another world. Then he drew a circle and pointed off over the plains, finally getting the message across that we had landed there.

The tale went on. We had been captured by the Squares and threatened with torture. He drew a big

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hairy insect, and the way the things turned eye-stalks to look at each other showed that they understood plainly. Evidently this was a form of torture common to them all.

And then Farman managed to convey the message that we had been sent under threat of death to bring about the destruction of the Rounds. And at the end of the harangue, he carefully handed his loin cloth to one of them.

Excitement followed as the small tubes of explosives were discovered. I thought for a moment that we would be torn to pieces, but even to the dullest brain it was clear that we were friendly or we would never have surrendered our deadly burden.

For the time, at least, we were saved. There must be, we reasoned, some show of gratitude in even the fiercest of these ice-eyed monsters for such an act.

We reasoned wrong, as it was to develop. We could see later why the Thing in the laboratory, when it sent us forth with the explosives, didn't anticipate the simple act of surrender we had performed. It knew its breed, and what happened to captives, only too well! Its only mistake was in not realizing that we, from another globe, didn't know.

For the moment, however, we were satisfied that we were safe. There was a jar, and the tower began to move again, now directly over the prairie toward the circle we had left. In an amazingly short time we were within a half mile of it. We could imagine the cold-eyed Thing in its underground laboratory, bent tensely over the tell-tale metal plate, watching.

One of the Things wheeled out a sort of catapult and fastened our loin cloths in the sling. He released the contrivance. The metallic patches of fabric sailed through the air. It seemed to take them minutes to hit the ground—in the center of the circle we had left.

There was a terrific explosion. The tower swayed sickeningly, then steadied. Everything within the distant metal circle geysered up into the reddish sky. We caught glimpses of twisted metal, and of several tiny, shattered things that seemed to move slightly. . . .

"That's the finish of our three-legged friend and his damned cannibalistic torturing bugs," breathed Farman. "And of our chances of getting back to Earth again," he finished.

I looked at him.

"We might have been shot back to where we came from by standing in that circle and having the lever set to its repelling instead of attracting point," explained Farman.

The tower moved off, seeming to stalk stiff-legged with triumph. Dully we leaned against the railing, unhampered by the monstrosities about, seemingly accepted as allies. Miles were covered before the rushing speed of the tower slowed. It stopped. We looked down.

There, under and around us, was another metal circle!

HERE, as on Earth, invention in war gave rise to invention. The Squares perhaps had invented the moving towers. The Rounds had countered with the same. The Squares had invented the deadly repelling circle. The Rounds, through spies probably, had countered with the same—though it looked as though the Squares did not know that yet.

But the important thing to us was the fact that we could hope again where all hope had seemed lost.

"Maybe we can persuade them to send us back where we came from in return for the favor we did them," said Farman. "It seems little enough to ask."

But little as it was, it was speedily revealed to us that the request would not be granted. When Farman pointed to the circle, to us, and then to the red heavens, asking plainly that we be repelled from the crimson planet, the inhuman Things got his meaning clearly. And made no sign of any kind! It looked as though they had plans for us, or were perhaps simply keeping us for some cold-blooded diversion of torture.

Farman squared his jaw, but made no move. With their deadly wires and

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their overwhelming numbers, the Things would have made short work of any attempt at violent escape.

The big scoop rose up and began weaving back and forth doing service as an elevator from turret to ground. Soon all of us stood on the prairie. Nowhere, save for the great metal ring, were there signs of life. But soon a door, like the trapdoor of the Squares, was opened. The fighting crew filed down into the ground through this. We were prodded after them by half a dozen of the Things which had evidently been detailed as our special guards.

Corridor after corridor stretched away from the bottom of the ramp we descended. This was evidently a great city, buried under the ground. I had a crazy wonder as to whether cities on our own Earth might not some day be all underground, what with the increasing ferocity and frequency of our own senseless wars.

We were pushed only a short distance down one of the interminable corridors when we were halted opposite a door. The door rosé up, and we saw a laboratory quite similar to the one in which we had first recovered.

A Thing teetered toward us on clashing legs that seemed more greyish than red-black. The creature moved sluggishly, as though it were very old. It touched familiar-looking, mighty coils carelessly as it passed them. Evidently it was the presiding genius of the place.

"Science seems to be king here," I whispered to Farman. "Both with the Squares and the Rounds we have been brought to the laboratory first."

Farman only nodded. All his attention was centered on a certain crooked lever beside a metal telltale plate.

"If we only could fight our way up to the surface of the prairie and then force one of our captors to throw the lever," he muttered.

The age-enfeebled Thing that ruled here glared at us speculatively out of slowly weaving eyes. There was no curiosity in those eyes, only a queer, intent gleam.

At some command which we could not hear, our guards shoved us over to a deep receptacle beside one of the great coils. The aged Thing came after us. Into the receptacle it thrust a metal rod, carefully, as though whatever liquid was in the vessel were very deadly and dangerous to handle.

The Thing glanced from the receptacle to us. Intuition told me what was coming.

"They've got some new concoction, probably for war use," I whispered to Farman. "And they're going to try it on us to see how it works."

Farman said nothing, but his face got white, and his eyes told me that his guess was the same as mine.

The aged Thing turned toward a nearby wall. I looked there. Set into it were gleaming metal hoops, open at the ends, for the purpose of holding struggling bodies in secure metal bonds against the wall. They were apparently to be used on us, now.

What was in the receptacle? Acid? Heavy, deadly, almost liquid vapor? What? Certainly something that brought quick annihilation, judging from the way in which the Thing had cautiously stirred it.

At another soundless command, the Things that guarded us approached closer. They raised their weapons, probably with the idea of stunning us. But the triple eyes of the Thing in command here glinted a bit, and the wires were lowered. It seemed that it didn't want us stunned for this experiment.

THE Things laid down their weapons, to catch us by arms and legs and drag us to the wall.

I have never seen a man move as swiftly, as explosively, as Farman moved then. Without warning of any kind, he sprang straight at the group. Those thick wires, dealing such instant unconsciousness or death, lay on the floor now. The Things, six to two against us, had been too confident in their numbers!

Like a footbball player, Farman charged the group, great arms spread wide. He knocked three of them from their tripod legs before they could balance themselves against his rush.

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He got to the wires on the floor.

With a savage shout he raised one, and pointed it first at the Thing that still teetered feebly near the deadly receptacle. The Thing started to draw the metal rod from the vessel.

I think I lived a year in that second. The scientist-Thing was drawing out the deadly rod. Farman was fighting to find whatever trigger or release-catch it was that made the wire a weapon. The three monstrosities he had bowled to the floor, plus the other three, were leaping at him.

Then I saw the aged Thing go down, slumping horribly into the receptacle beside it. A thick reddish vapor boiled up, and the chitin-protected body seemed to melt into thin air. Farman had stumbled onto the secret of the wire, whatever it was.

He turned it on the charging group. He got three of the Things. Four! Then he was caught by the remaining two. They coiled their triple arms around him and wrenched for the wire he held.

UP and down the three figures writhed and fought while I raced for the rest of the weapons on the floor.

One of the two got near enough to trip me as I fled. But when I fell, I fell with the nearest wire within my reach. I got up with it, wondering what in the world had to be done with the thing to make it work. But there was no need to find out. Farman had torn from the two in that instant, and blasted them with his wire.

"Run upstairs," he panted to me. "Out the trapdoor. Stand in the circle. I'll throw the switch."

"Who'll throw the switch for *you?*" I protested.

"Not necessary. I'll leave it on, and follow you. Run! This will be our last chance—"

I ran. Out the laboratory door, along the corridor, to the ramp leading up to the trapdoor. Here were two of the ghastly Things, evidently guardians of the gate. I waved for them to open the trapdoor, pointing the wire in a gesture that threatened them with death if they did not obey.

Luckily they hadn't the slightest suspicion of the fact that I couldn't have worked the weapon if I had wanted to. Their icily ferocious eyes glazed with fear, they threw open the trap. The red light of the heavens streamed in.

I ran up into the open. Around me spread the big metal circle. I stood there waiting—waiting for the miracle to happen that should transport me back to Earth. When Farman threw the switch—

But seconds passed and I was not so transported. I was still there. Something must have happened to keep him from moving the lever.

Now I heard a commotion, and shouting, from the direction of the laboratory. The shouting was the bull-roaring of Farman. He was being attacked again, held from the repelling lever. Reinforcements must have come to avenge the killing of the Things Farman had downed. [Turn Page]

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I turned to go to help him. But in that instant Farman must have fought his way to the switch.

Once more I was seized by the terrible agony that had preceded my transfer to this globe of war and hate. I felt as if my body were being blasted to bits.

I was back in the stratosphere shell. My whole body quivered with nauseating agony. But the veil of torture was quickly pierced by memory.

"Farman!" I called.

There was no answer from the body I saw stretched on the floor of the stratosphere ball near me. Between me and the body of Farman a bright sunbeam poured down through the glass trap on the top of the ball. In this beam, settling slowly down so that it was only a fraction of an inch from the floor, was a bright red speck of dust, a mote of brilliant crimson.

"Farman," I cried again, thickly.

Farman did not move. The red dust mote settled on the floor, extinguished like a tiny ember at the contact.

I GOT the balloon down. It landed here in North Carolina. During the long descent, Farman never moved. I thought he was dead. He was just as he is now, seeming to be dead by all ordinary physiological tests, but yet *not* dead. The reason, I am sure, is that his mind, his consciousness, reclothed in material substance when it was transported to that other world, *stayed* in that world, leaving his body only a shell.

Perhaps that shell will live for a thousand years. Ten thousand! Perhaps in a few days it will suffer true death. Meanwhile, Farman, companion on my ascent, is forever gone.

This, gentlemen, is my story. I swear on oath that it is the truth, the whole truth, and nothing but the truth.

* * * * *

(Jury foreman: "You are really trying to hint that you and Commander Farman were for a time on a 'planet' which turned out to be that tiny speck of dust?")

(Professor Stillwell: "This speck was undoubtedly cosmic *dust, settling in through the open trap while Farman wiped the frost clear, after wandering for untold millions of years through space. Who knows but what every speck of matter, every asteroid and tiny meteor, in all the heavens, has life on it?")*

(Jury member: "How could any force on a dust mote be powerful enough to draw to it two objects as vast as human bodies?")

(Professor Stillwell: "I repeat, it is my theory that only our minds, our consciousnesses, were so attracted.")

(Member: "And after they had been transported, your minds took on bodies again?")

(Professor: "Yes. Bodies identical with the ones housing our minds on Earth, but microscopic on that small planet.")

(Member: "How could that be possible?")

(Professor: "I don't know. How did minds on Earth become clothed with bodies? Did the bodies come first and the minds grow in them later? Or was pure thought first, becoming gradually surrounded with a materialization of matter to suit, like the hardening of a shell?")

(Jury foreman: "Please do not answer questions with questions. You have given us an account plainly either imagined or insane, for which you have not one single shred of proof—")

(Professor: "I submit the body of Commander Farman as proof. There is his shell, his corpse, not living, not dead. Where is his soul, or mind, or life spark—whatever you care to call it?")

(Jury foreman: "There can be little uncertainty about the verdict of this coroner's jury. I recommend again that Professor Stillwell be subjected to strict mental tests, and I further recommend to a court of law that he be held in the state asylum for the insane. I guess that will be the court's verdict, all right. Criminally insane, perhaps.")

(Jury members: "Agreed.")

(Professor: "For God's sake, gentlemen—")

(Jury foreman: "Officer, please take care of the prisoner.")

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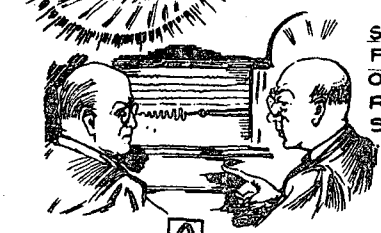
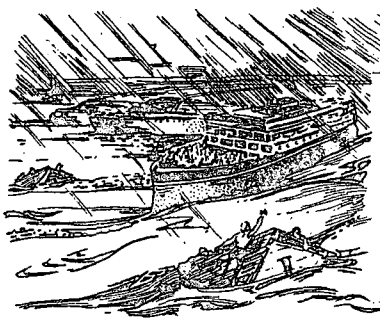
BY JACK BINDER

IF A SECOND DELUGE FLOODED EARTH!



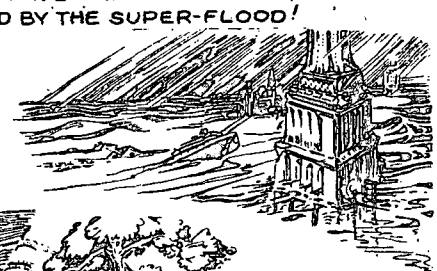
EARTHQUAKES, AVALANCHES AND THE SCIENTISTS' SEISMOGRAPHS WOULD GIVE FOREWARNING OF THE COMING HOLOCAUST OF WATER. THEN DAYS AND WEEKS OF RAIN. MANKIND WOULD BE ENGULFED BY A SECOND BIBLICAL DELUGE!

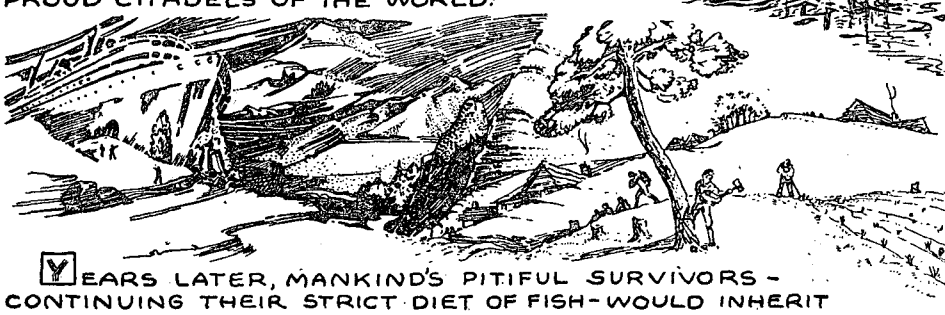
A TERRIFIC STRAIN ON EARTH'S SURFACE WOULD CLIMAX ITSELF IN MAJOR LAND MOVEMENTS. RISING, ANGRY TIDES WOULD POUR DEVASTATINGLY OVER ALL SEACOASTS, SWEEPING INWARD TO MEET THE ROILING WATERS OF SWOLLEN RIVERS AND LAKES. LEVEL LANDS WOULD COMPLETELY SUBMERGE. MOUNTAINS WOULD BECOME ISLANDS!



HASTILY BUILT ARKS, STOCKED WITH EARTH'S SURPLUS GRANARY SUPPLIES, WOULD SAVE ONLY THOUSANDS OF HUMANS, LEAVING MILLIONS TO DROWN. THERE WOULD BE NO HAVEN OF SAFETY. THE ARKS WOULD JUST DRIFT WITH THE TURBULENT WATERS. NORMAL INDUSTRY WOULD BE PARALYZED. MOST LIFE, SAVE THAT OF THE SEA, WOULD BE DESTROYED BY THE SUPER-FLOOD!

IN CITIES, SOME OF THE STEEL SKYSCRAPERS - WITHSTANDING THE FURIOUS LIQUID DOOM - WOULD HOUSE PACKED, STARVING MOBS. WATERY DEATH WOULD STALK THE PROUD CITADELS OF THE WORLD!





YEARS LATER, MANKIND'S PITIFUL SURVIVORS - CONTINUING THEIR STRICT DIET OF FISH - WOULD INHERIT NEW CONTINENTS, NEW LANDS DENUDED OF LIFE. CIVILIZATION WOULD START ITS UPWARD CLIMB FROM THE BOTTOM AGAIN!

Next Issue: IF EVOLUTION SPEEDED UP!

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WHEN SPACE BURST

Again and Again the Pioneer Tried to Plunge Through a Mighty Cosmic Barrier!

By
EDMOND HAMILTON

Author of "Mutiny on Europa," "Space Mirror," etc.

"TEN billion miles!" cried John Haley exultantly. "The furthest any ship has ever gone outside the Solar System!"

Mart Allinson nodded, his eyes glistening with emotion.

"The *Pioneer* has done it, John. Our ship—our dream."

The two young men stood in the pilot house of the little space ship, peering out into the star-gemmed blackness of interstellar space. Out there amid the thronging stars burned a bright yellow one. It was the sun of their own Solar System. Their ship was so far out from it that it appeared to be only another star.

They were alone in the glassite-walled pilot house. A deep silence reigned, for the atomic generators and rockets had been cut off. The ship was drifting in the void, having blazed a trail more distant than any ship had ever gone before.

"I knew we'd set a new record!" Haley was saying, his square, rugged face alight. "Mart, where's Doctor Rider? He must certify our record

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for us officially."

"He's still in the observatory cell," Allinson answered. "You go see him—I'll wait here at the controls."

Haley flung open the door of the pilot house and hurried down a ladder and back along the main corridor of the little torpedo-shaped ship. He met lank, dour Angus Anders, their engineer.

"Lad, we did it, didn't we?" asked Anders anxiously. "We set a new record?"

"We did, Angus, and the credit goes to you for the way you pushed those generators," Haley told him. "You'll likely be decorated by the Earth Government when we get home."

"Bah—who wants a fancy medal," scoffed Anders, though a grin cracked his craggy face.

Haley hurried on along the corridor and threw open the door that gave entrance to the observatory cell. This was a small room crowded with astrophysical instruments. Telescopes and spectroscopes loomed here, their lenses set in the ship's outer wall.

Doctor Thomas Rider's spare, elderly figure was hunched at one of the instruments, and his slim, vibrant, red-headed young daughter waited anxiously beside him. She was her famous father's assistant, and it was to further his abstruse researches in cosmic physics that the Earth Government had financed construction of the *Pioneer*.

"Doctor Rider, our space log shows ten billion miles since we left the orbit of Pluto," said Haley excitedly. "We want you to certify it for us now."

"Quiet, John!" said Ethel Rider quickly, in a low and urgent voice. "Don't disturb him now."

Doctor Rider had not turned from his taut crouch at the telescopic instrument, had not even heard. The astrophysicist's superhuman concentration indicated something unusual. And now Haley noticed that Ethel's vivid face was pale and strained, that her grey-green eyes were deep with strange dread.

"Why, what's the matter, Red?" he asked her puzzledly. "What's your father doing?"

"He's rechecking observations we made on the outward trip," Ethel told him. "We've gone over our calculations three times and we're sure that they are right. If the observations on which we based them prove correct, too, it means something terrible, means that—"

Doctor Rider suddenly turned, and Haley's heart missed a beat as he saw the wild expression on the scientist's ordinarily austere face, the fixed horror in his eyes.

"Father?" cried Ethel imploringly.

"The—the observations check, Ethel," Doctor Rider said huskily. He turned toward Haley. "John, give orders to start the *Pioneer* back toward the Solar System at once, at full speed!"

"But I don't see—you've not certified our record yet—" objected Haley, stunned.

"Your record?" the scientist shouted wildly. "What does your record mean now? What does anything mean in the face of what's going to happen? Give the order, I tell you!"

Driven by the fierce command, John Haley opened the door and yelled down the corridor: "Angus! Start the generators at once. Mart, stand by for a quick start as soon as the generators are going!"

He turned, facing Dr. Rider.

"In five minutes we can have the rocket-tubes going," he exclaimed. "But what in the world is it that's going to happen?"

"The greatest event in the history of the cosmos is about to take place," the shaken scientist told him. "Haley, a cosmic collapse is imminent, may come at any moment. Space, the space of our cosmos, is about to *burst!*"

Haley stared at him stupefied.

"Can't you understand?" the doctor went on. "You know that space, our ordinary three-dimensional space which makes up our cosmos, is not infinite but finite—is *curved* in a fourth dimension. It is so curved back on itself that it forms a great sphere, floating in the four-dimensional abyss.

"And you must know, too, that spherical space is expanding, stretch-

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ing out like a great bubble being blown up. Why, Eddington and De Sitter and all those other old scientists of five hundred years ago knew that. The bubble of our space has expanded like that for ages and it has been getting too big! It has got so big, the strain on it so great, that now it is about to burst!"

DOCTOR RIDER'S thin face was colorless and his hands were trembling violently as he continued.

"I made this trip outside the Solar System in the *Pioneer* so that out here, away from the distorting gravitational forces of the sun, I could study this space strain. I've been studying it during all our outward trip.

"My observations and calculations show infallibly that the strain of expansion has become so great that our spherical continuum of space is going to pop like a breaking balloon. Space will be ripped to fragments at any moment, and those fragments will henceforward be separated from each other by a four-dimensional gulf in which there is no space!"

"God, and we're ten billion miles outside our System!" cried Haley. The full terrible nature of the menace unfolded in his brain. "If we can only get back there, at least, before the thing happens—"

He lunged out of the small room into the corridor, running desperately toward the pilot house with Doctor Rider and Ethel close on his heels. The whole fabric of the *Pioneer* was quivering to the rising drone of the great generators, as they disintegrated matter into atomic force that would be poured out of the rocket-tubes in blasting streams of fire.

Haley burst into the pilot house, and Mart Allinson's keen, youthful face flashed alarm as he saw his friend's countenance. In incoherent, tumbled words, Haley tried to explain, and saw Allinson's expression freeze into incredulous horror.

Doctor Rider was climbing into the pilot house ahead of Ethel.

"Start, Haley! Start at once!" he cried.

Haley reached for some small shining levers in the bank of complex controls before him, jammed them rapidly downward. The *Pioneer* shook with a tremendous shock and roar as all the stern tubes blasted at once. The three men and the girl in the pilot house were pressed against the rear wall by the sudden start. Quickly the ship gathered speed, heading toward the bright yellow star of their own System. Then—

"Look, it's happening! It's happening now!" Doctor Rider cried wildly.

Their faces ghastly, frozen masks, all looked out through the glassite wall at the most stupendous thing that had ever happened or ever would happen in the cosmos.

The stars had suddenly gone mad in the heavens! They were cometing through the sky with nightmare, incredible speed, great swarms of them driving away from each other. The firmament itself seemed splitting, great rifts of blackness appearing here and there, cracks in cosmic space itself.

Such a widening crack appeared *between* the speeding *Pioneer* and the distant Solar System. It widened with the swiftness of thought into blackness. The Solar System and all the stars beyond it abruptly vanished from their vision.

"My God!" yelled Doctor Rider. "Space has burst and we're caught in a section closed from our Solar System. We're—"

"Look at that!" cried Mart Allinson hoarsely, pointing back up through the glassite roof of the pilot house. "Suns running mad—that one's coming right at us!"

The hair stood up on John Haley's head as he looked up. The sky behind the *Pioneer* still held many stars and some of these stars were approaching the ship with delirious speed, enlarging with ghastly rapidity.

Already one of the stars had expanded to fill a quarter of the heavens behind them, a colossal white sun whose blinding glare drenched them through the glassite walls. It was rushing straight upon them with inconceivable velocity.

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Then, as the white sun bore down on them in that wild storm of stars, the *Pioneer* was seized by immense forces and batted through the void like a chip. They were flung violently to the floor of the pilot house, John Haley's head hit the floor with a crack, and he felt Ethel fall across him as consciousness left him.

Haley came back to awareness of his surroundings, feeling supporting arms that quivered as they held him.

"He's coming to, Ethel," said a reassuring voice that he recognized as that of Doctor Rider.

Haley opened his eyes, then was forced to close them a moment by the glare of intense white sunlight. He opened them again in a moment, more cautiously.

He lay on the pilot house floor, his head held by Ethel Rider, her tear-stained face bent over him. Doctor Rider, pale and shaken, was stooping to him, and beyond he glimpsed Mart Allinson with a bleeding cut on his forehead, and the craggy, anxious face of Angus Anders.

"What—what happened?" Haley faltered. "The *Pioneer*—"

"The ship wasn't harmed, John," said Mart quickly. "We're safe—for the time being."

"Aye, for the time being," muttered Anders grimly. "How long we're going to live is a different matter."

Haley staggered to his feet, helped by Ethel. Leaning on the girl's firm little shoulder, he looked bewilderly out through the transparent wall.

Out there in black space, only a few hundred million miles from the *Pioneer*, glared the huge white sun he had last seen rushing upon them. Now it blazed serenely motionless in the void. Beyond it was visible a sky of sparse and scattered stars that also had ceased entirely their crazy gyrations.

"That white sun!" exclaimed Haley. "It was thundering right down on us—I thought we'd crash into it."

"We almost did," Doctor Rider said soberly. "It just happened that the *Pioneer* was not directly in the sun's path. As it was, we were of course caught in the star's gravitational grip."

"But the Solar System—our own sun?" cried Haley, his eyes hopefully searching the strange new heavens. "Where—"

The scientist shook his head somberly, and Haley saw the same dark foreboding on the faces of the others.

"We are cut off forever now from our own Solar System, John," said Doctor Rider. "The spherical space of the cosmos burst, as you saw, into fragments. We are caught in a different fragment of space from the fragment which holds our Solar System, are separated from it by an unnavigable four-dimensional abyss.

"The patch of space we happened to be in when the bursting occurred at once closed up on itself to form a smaller space-sphere like the former vast one of the cosmos. Such closing of space which contains matter is inevitable, due to the distortion of space by the gravitation of the matter it holds. It was the sudden closing up of this remnant of space which brought that formerly distant white sun suddenly near us. Just as two points far-separated on a sheet of paper can be suddenly brought close together by rolling the paper up into a circle."

"But how are we going to get back to our own Solar System?" asked Haley.

"We can never get back to it," said the scientist sadly. "The gulf of the fourth dimension forever separates the space of this tiny cosmos from the space of that other little new cosmos which now holds the Solar System."

The full, freezing force of the situation came home to John Haley's heart. The cruel, bitter irony of it bit into his soul. That he should have toiled so long to build the ship, that he should have spent so many weary weeks forging out from the Solar System, only to cut himself and his friends and the girl he loved away from their home forever!

"Surely there's *some* way of getting back, Doctor!" he exclaimed desperately. "We can't just give up."

DOCTOR RIDER shook his head. "I'm afraid we must, John. We are three-dimensional matter and

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as such we cannot leave this three-dimensional space; we cannot enter or cross the four-dimensional abyss which separates us from our System."

"But couldn't we use a tremendously powerful vibratory force to propel the ship suddenly through that four-dimensional void?" Haley insisted. "I've heard such a thing proposed many times. Physicists have pointed out that a man leads an almost two-dimensional existence on the surface of Earth, utilizing only slightly the vast third dimension of depth; that, by using thousands of times his own power, he has been able to propel himself into this third dimension in an airplane. Why can't we project this three-dimensional ship through the fourth in the same way, by a sudden tremendous application of force?"

The elderly scientist's somber face remained impassive as he answered.

"Theoretically it is possible, John. We could rig a projector and do it easily, if we had enough power. But we haven't—it would require a thousand times more power than the generators of the *Pioneer* could produce, so it's out of the question."

"What are we going to do, then?" pursued Haley. "We've got to do something—we can't just float around this sun in our ship until our air and rations are gone."

Mart Allinson interrupted, a slight gleam of hope on his keen face.

"We've a little chance, John. Before you regained consciousness, Doctor Rider discovered that this sun has one planet, a large world not very far from us. We're going to head toward it, and maybe it will be habitable."

Haley nodded slowly.

"It looks like the only thing we can do. If it only has a breathable atmosphere and edible vegetation on it, it will give us a respite at least."

Soon the rocket-tubes were blasting strongly, propelling the *Pioneer* toward the speck of steady light that was the distant planet. It was almost lost to sight in the tremendous glare of its great parent sun.

Haley watched the planet slowly grow larger in view, peering from the pilot house while Mart Allinson handled the controls. Dark forebodings clouded his mind despite himself. He foresaw at the best a horrible, lingering existence of utter isolation to which death might be preferable.

He discovered suddenly that Ethel Rider was watching beside him, her grey-green eyes fixed too on that distant world.

"John, what kind of life will it be for us on that world?" she asked. "Four men and one girl—cut off forever from the rest of our race. Marooned for the rest of our lives, without hope."

"Don't think of that, Red," he said brusquely, putting an arm around her slim, quivering shoulders and drawing her bright head against him. "Things will work out somehow."

"I wish almost that our ship had fallen into that sun," she whispered. "It would have been better than this dreadful isolation far across the Universe from our own world."

He could find nothing to say to that. He knew with terrible certainty that she was right. Yet the old human instinct to struggle until the last possible moment, to fight blindly until the very instant death closed down, persisted in him.

He watched intently with the girl as the planet ahead loomed larger. It was twice the diameter of Earth, Haley saw, a big pale globe spinning here in the terrific glare of the diamond-white sun.

MART ALLINSON was expertly using the bow rocket-tubes to break their fall as the *Pioneer* rushed in toward the planet. The ship shot downward with a smooth rush, through a gaseous envelope that screamed loudly against its walls.

"By heaven, it's got an atmosphere of some kind, at least!" Haley exclaimed tensely. "If it's only breathable!"

"Father's down in the observatory cell now, checking it," Ethel said. Then she cried, "But John, look—"

He stared down with an amazement equalling hers as the surface of this alien world rushed up toward them. The landscape below was a barren,

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desert one of endless white rock and sand and it all was faintly shining. A pale, eerie glow came from every particle of its surface.

"That's queer," he muttered as Allinson maneuvered the ship in a circle before landing. "That shining—"

Doctor Rider rushed suddenly into the pilot house.

"Don't land, Mart!" he yelled. "If you do, we're lost—this whole world is one of radioactive matter that will burn and destroy us!"

The craft had been dipping low for the landing at that moment, but Mart Allinson acted with instinctive swiftness, jamming the rocket controls over hard.

The *Pioneer* tore upward screamingly with a jerk that flung them all once more against the wall. At that frenzied speed, they were out of the planet's atmosphere in a few minutes.

Doctor Rider wiped his glistening brow with an unsteady hand.

"That was close!" he whispered. "I was down in the observatory cell checking the atmosphere. I'd just found that it was a deadly compound of radioactive gases, when I noticed by my other instruments that this whole world is highly radioactive. Every atom in it is unstable, emitting terrific radiation!"

John Haley, whose face had suddenly become strange, exclaimed, "A radioactive world? But that means—"

"It means that our last chance is gone," Doctor Rider said bitterly. "This sun has no other planets—we're doomed to float here in space until we starve or die for lack of air."

"Couldn't we reach one of those other stars in the *Pioneer?*" suggested Mart Allinson desperately, pointing through the wall to the sparse stars glittering beyond the huge white sun. "Surely some of them have habitable worlds."

Doctor Rider shook his head.

"They're too far from us—I've already checked their approximate distances and the nearest is over a light-year away. No, our bolt is shot. We're marooned here in a zone of space forever separated from the space of our own Solar System, and we can't live here for very long."

He looked them all squarely in the face.

"I don't know what you people think, but I believe it would be better for us to open the space doors of the ship and die in a moment, than to prolong our existence into the horrible death of starvation or suffocation."

"Yes, it would be far better!" Ethel Rider cried. She turned to Haley. "We don't want to see each other die in torture, do we?"

But John Haley's face was flaming from excitement.

"Will you all stop this talk of dying and listen to what I've been trying to say?" he cried hoarsely. "We don't need to die at all—we have a chance to live, to get back to our own System!"

HE pointed down through the wall to the palely shining world beneath.

"You said that was a world of radioactive matter, Doctor. All right, you ought to know that if you use radioactive matter instead of ordinary stable matter to disintegrate in atomic generators, you get thousands of times more power.

"If we get a hundred pounds of that radioactive soil and use it in our generators we can produce tremendously greater power. Enough power to do what I was talking of, to hurl the *Pioneer* temporarily out of three dimensions into the fourth, to project it back across the four-dimensional abyss to the space remnant that now holds our Solar System!"

Doctor Rider's eyes were suddenly narrowed, bright.

"It could be done," he whispered hopefully. He turned to Anders. "How long would the generators hold up, using radioactive matter for fuel, Angus?"

Angus Anders shook his big head grimly.

"Not for more than five or ten minutes! Why, that glowing stuff would wreck the generators with its emanated forces in that little time, for sure."

"Yet that might be time enough!"

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Rider exclaimed. "If we can actually project the ship into the fourth, our crossing of the abyss should be nearly instantaneous. For our ordinary three-dimensional time does not operate in the fourth."

Then the scientist's face fell.

"But we're forgetting something. How can we even get any of that matter into the ship? We can't land on that world—it would be fatal to the ship."

"We don't have to land," Haley declared quickly. "We can hang motionless a few hundred feet above the ground, and you can let me down, in my space suit, by a rope. I'll take a lead container and fill it with the radioactive soil."

"And you'll be burned, perhaps fatally, while you're doing it," the scientist said grimly. "A metal space suit won't keep out the deadly radiations down there, John."

"My suit will!" Haley exclaimed. "I had it fitted a year ago with a special ray-proof lining so that I could explore a radioactive volcano on one of the airless satellites of Saturn. You can let me down and I can get the stuff without danger.

"Head back down to the surface, Mart, and hold the ship steady five hundred feet up," he directed hastily. "Angus, I want you to lower me from the space-lock."

Within a few minutes, the *Pioneer* was poised five hundred feet above the shining surface of the deadly planet, its rocket-tubes purring just enough to hold it suspended there.

Haley and the engineer entered the keel space-lock of the ship and donned metal space suits, then opened the trap in the floor, letting the air puff out. Then Angus Anders carefully lowered Haley at the end of a thin, strong metal rope. Tied to the belt of the descending young man's suit was a large covered leaden box and a small spade.

The others watched tensely from the lower windows of the poised ship as John Haley's metal-clad form dropped at the rope's end toward the shining soil. They saw him alight and start to work with frantic speed, shoveling the glowing soil into the container. In a few moments they could see him swaying erratically, staggering.

"The greater gravitation of this world must be getting him," Doctor Rider said tautly. "There, he's got the container full. Angus is hauling him up."

WITH the heavy leaden box dangling at his belt, John Haley was rising again toward the ship. Cold fear clutched Ethel's heart as she saw how limply Haley hung. As soon as he was inside the space-lock, the door slammed shut and released air hissed into the lock as the engineer turned a valve.

Angus Anders then tore his space suit off and shouted to Mart Allinson, up in the pilot house.

"All right, get up away from here! We daren't stay this near that devil world for long."

Allinson sent the *Pioneer* flying up through the poisonous atmosphere. Meanwhile, Ethel and her father were helping the engineer take the space suit off Haley's limp figure.

As they pulled off the helmet, Haley's face emerged, white and with eyes closed. Ethel uttered a choked cry of horror as they took off the suit. John Haley's body bore terrible blue burns that were deepest on his hands and legs.

"The radioactive emanations down there have burned him badly!" Doctor Rider cried.

"I'll get the first-aid kit!" exclaimed Anders as he raced toward the generator room. He was back in a moment with a case from which he took a silver box of white paste. Swiftly he smeared this on the unconscious John Haley's burns.

"Stuff is meant for use in atomic blast burns," muttered the engineer as he worked. "But it's good for radioactive burns too—will neutralize them before they work deeper into him."

Haley opened his eyes, his face twisted by pain.

"You got the lead box all right?" he mumbled. "I was afraid—I'd drop it—"

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"Lad, what went wrong?" Anders demanded anxiously. "The ray-proof lining of your space suit must have been faulty—it certainly didn't keep out the emanations down there."

John Haley grinned weakly.

"That suit has no ray-proof lining," he confessed. "I just told you that—I knew you'd not let me go down there for the stuff if I didn't. And we had to have it!"

Ethel bit her lip, and her eyes blinked with unshed tears. Her small hands tightened around his burned ones as she said in a choking voice, "John—"

"I'll be all right, Red," Haley reassured her. He stirred and struggled weakly to his feet, with their help. "There's no time to lose. We've got to rig the projector at the stern that will fling the *Pioneer* through the fourth dimension. And you, doctor, will have to compute the direction we must take across the abyss to hit the space zone of our Solar System. Can you do it?"

"I think I can," said Doctor Rider, though there was haunting doubt in his eyes. "I'll have to calculate by pure mathematics the position which that other cosmic fragment of space would have assumed relative to this one—a problem no astrophysicist ever tried before."

"Start on it at once, then," John Haley urged. "Angus, you help me back to the stern and I'll try to help you and Mart rig the projector."

Eight hours later, the work was done. During that time the *Pioneer* had floated motionless out in space away from the devil world, and there had been feverish activity by Mart and Angus back in the tube-rooms at the stern. Haley, sitting weakly in a chair, with Ethel clinging to his side, had supervised.

The projector was ready, the simple mechanism that was to hurl the ship and all in it across the awful extra-cosmic breech that no human beings had ever entered before. The thing was a large metal cone, its apex fitted back into the conical stern of the ship. From the cone would radiate forward the vast force that must thrust every atom of the ship through alien dimensional gulfs. Connections ran from the cone through complicated transformers and condensers to the great generators. The switches were in the pilot house.

DOCTOR RIDER finally emerged from the observatory cell. The scientist staggered a little, and his face was dead white and shining with perspiration from his long ordeal. He handed Haley a slip of paper.

"That—that's the direction the ship must be pointing when you turn on the force. It should hurl us straight across the gulf to the space remnant that holds our System."

Then he suddenly added torturedly, "God, if my calculations have erred! We'll be flung through the fourth dimension far across infinity, perhaps into some utterly alien universe!"

"Steady, Doctor," Haley said quietly. "We all know the chances we're taking."

"Ready to start the generators, Angus?" he asked the engineer.

Angus Anders nodded, his craggy face a tight mask.

"I don't dare put that radioactive matter into them until we're all set to go, lad."

"We're set now," Haley told him. "Use only ordinary matter in two generators—we'll need them if we do make it to the Solar System. Feed the radioactive soil to all the others."

Anders, without a word, opened the leaden box of shining soil that Haley had secured at such cost to himself. Using long leaden gloves, the engineer rapidly shoveled pounds of the glowing matter into the hopper of each generator, save for two.

The great generators began instantly to purr, a humming that waxed swiftly into a thunderous drone. They rocked on their bases, the whole ship quivering wildly, as the disintegration of the radioactive matter in them produced a power thousands of times above the normal.

John Haley watched like a carven statue as the dial-needles on the wall mounted rapidly. The terrific power now being produced by the generators

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was being stored up in the condensers, ready to be released from the conical projector at the stern in one colossal bolt.

"Generators are starting to crumble a little already," remarked Angus calmly over the thunderous droning.

The mechanisms were giving off a feeble luminosity, beginning to disintegrate slightly around the edges.

"We'll have enough power in the condensers in a few minutes, if those generators just hold up," Haley said nervously. "Try to keep them going, Angus, I've got to make ready for the start."

With Ethel and Allinson helping him, and Doctor Rider following, Haley climbed to the pilot house. There, using the power of the two normally functioning generators, he carefully swerved the *Pioneer* so that it lay in space pointing along the course the astrophysicist had computed.

Then Haley waited, his hand on the switch of the projector, the control that would release the condensers' stored power in one vast surge. They started as there came a loud crash from the generator-room, audible above the humming mechanisms.

"Two of the generators just went to pieces," Anders cried out. "The rest are going fast but we'll have power enough in about a minute. Stand by!"

"Standing by!" Haley cried back, his hand tight on the handle of the switch.

"I'm not afraid, John!" exclaimed Ethel, her face taut with emotion. "I'm not!"

"Good girl, Red," whispered Haley with a strained smile.

THE crash of more crumbling generators sounded below. Immediately following it, came Angus Ander's high-pitched yell:

"Let her go!"

Click! Haley's hand convulsively closed the switch.

Then it was like the end of everything. A stupendous shock of force that seemed to Haley to be wrenching the atoms of his body one from another. A terrible vertigo, a feeling of falling into fathomless depths.

He forced himself to keep his eyes open. Doctor Rider had sunk to his knees; Ethel lay in an unconscious heap on the floor and Allinson was clutching a stanchion for support.

Through the glassite front wall the Universe was a nightmare before his eyes! The scattered stars that had formerly extended normally away from them in all directions were now all behind them, and were curved in a crazy geometry his eyes could not completely apprehend. He saw this little cosmos as a weirdly *angled* sphere, an insanely proportioned island of three-dimensional space floating in extra-spatial abysms.

The *Pioneer* was being hurled through those black abysses outside space at incalculable velocities. Ahead, like shining bubbles, glittered other continuums of space, each holding hundreds or thousands of suns. One of them was dead ahead, its appearance and exaggerated proportions changing crazily as the ship neared it.

John Haley could never remember whether it seemed ages to him or only instants that the craft rushed through the four-dimensional abyss. In that dimensional realm, time was different and not to be understood by his human senses. He only knew that somehow the *Pioneer* was finally driving like a bolt of lightning into the great sphere of curved space that was their goal.

And once inside it, the ship was driving *through* suns and worlds. They were merely a flare of light or an instant of darkness, and the ship was through them. Their three-dimensional matter was unreal to the ship moving through four dimensions.

Haley's eyes searched frantically amid those hundreds of stars. At last he recognized amid the vastly altered constellations the yellow star of his own sun blazing dead ahead. In the instant that he reached wildly to throw off the switch, that star loomed up as a flaring sun, the tiny, slow-circling light-specks of its planets around it.

The switch clicked open in Haley's hands. He felt again, more cruelly, that awful wrenching force that tore

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at every atom in his body, as the projector ceased functioning and the ship and all in it snapped back to normal.

HALEY recovered enough strength to draw himself up and peer shakily from the pilot house window. Out there now, space looked normal again. The insane curving of geometry was gone, and there stretched a black vault that held a thin cloud of scattered stars.

Amid those stars shone the bright yellow sun, no more than a few hundred million miles away. They were well inside the orbit of Jupiter, he discovered. The *Pioneer* was drifting aimlessly in space. He managed to revive Allinson, who staggered down to the generator room. Ethel and her father were already showing signs of consciousness.

When Allinson came back with Angus Anders, they found Haley holding Ethel tightly in his arms.

"John, we're all right now!" cried Allinson. "We can use the two generators still left us to limp along to Earth."

Doctor Rider's eyes were brilliant with excitement.

"We crossed the four-dimensional gulf, ventured outside space itself for the first time in history! Do you realize what that means, John? Do you realize that it can be done again, that—"

John Haley, bending over a bright red head buried on his chest, did not even hear.

FORECAST FOR THE NEXT ISSUE

BEARDED patriarchs slapped each other on the back and chuckled in glee as young Norton made last-minute improvements on his machine. Norton's invention was the ten thousandth application for a perpetual motion patent. If his machine worked, the scientists claimed, it would develop enough ergs to pull the hat off your head.

But it *did* work! The spokes on the machine did not falter or jerk, but built up its angular velocity until the whole apparatus was vibrating with alarming violence.

That's only one of the opening dramatic situations of ZONES OF SPACE, one of the greatest science fiction novelettes ever to appear in THRILLING WONDER STORIES. It's by MAX C. SHERIDAN, and presents an amazing theme centering around the sunken continent, Atlantis.

* * *

Anton York, the immortal scientist, of "Conquest of Life," lives again! In next month's issue EANDO BINDER narrates the story of Anton York remaking the Solar System. LIFE ETERNAL is a powerful story of applied science, one you won't soon forget!

* * *

Also, among the fine novelettes in the next issue, is DREAM-DUST FROM MARS, by a favorite writer, MANLY WADE WELLMAN. It's an ingenious story of commercial traffic in the stratosphere, and of the men who knew only one slogan: *Stratocars Follow the Sun.*

* * *

A thousand years from now one name will still be emblazoned in astronomy's Hall of Fame—Sir James Jeans. He is the most famous astronomer of modern times! THRILLING WONDER STORIES is proud to present an up-to-the-minute article on the newest phases of this popular science. It's an engrossing article more informative than a text book, more entertaining than an H. G. Wells fantasy.

* * *

In addition to all these stellar attractions, the next issue brings you more novelettes, several short stories, and newer, brighter features.

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THE BLOODLESS PERIL

Green tentacles coiled around him

Science Evolves a Superior Plant Kingdom When a War of the Future is Waged in the Laboratory!

By

WILL GARTH

Author of "Space Trap," "The Night Men of Mars," etc.

THE world map was dotted with blood. In Berlin, Paris, New York, Tokyo, tall buildings lay in wreckage with corpses dotting the debris. On the plains of the Argentine and the Dakotas men and cattle lay swollen in death caused by fungoid spores rained down in bombs from war planes.

World war! A fight to the death between the white and yellow races of the entire globe.

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In the East the center of strategy was Tokyo. Walled in by men and machines, barricaded by a shell of electronic force so tremendous that it drained the power resources of the Orient like water through a pipe, men moved pins on maps with the result that millions more died.

In the West the strategic center was Chicago. And there on the evening of April third, 1988, a war council was gathered between the High Command of the white race, and its greatest scientists. The meeting was for the purpose of coordinating science's contributions.

Hugh Farrell, President of the United States and of the council, faced the gathering. Overhead could be heard the drone of guarding stratosphere planes. The air quivered with the backlash of the electronic force wall barricading Chicago as Tokyo was barricaded.

But more than ionization made the atmosphere quiver. The yellow men were ahead in the war game and the whites knew it. The white race faced extinction.

Farrell put the realization into words.

"Occidentals, you have heard the situation outlined. We must find new weapons of war, or we die. So we have called you scientists to ask if you have anything to offer. *Anything*—so it may be turned to military usage!"

THERE was silence, then babel as the scientists were swept with war frenzy. A man leaped to his feet.

"*Herr Doktor* Bruenig," Farrell acknowledged.

"I offer my latest work," shrilled the man. "Chrome steel with molecules so arranged that no known projectile can penetrate it."

Thunderous applause. Bruenig sat down and two other metallurgists only a little less famous rose and gave up secrets representing decades of labor.

A big, barrel-chested man with a thick red beard and frosty blue eyes got up.

"Professor Ryder Storm."

The big man boomed: "I present to the High Command my recently isolated filterable virus known as Ryder's Palsy, and its antidote. As you know, an ounce of it dropped in an exploding glass vial can make imbecile, shivering wrecks out of all human beings within two square miles."

One after another the scientists of the West rose. Finally a Frenchman got up and said in cold, incisive tones:

"I am, as you know, a botanist. I came to give my latest hybrid—a poison flower which sprouts and grows rapidly, and the seeds of which can be dropped behind enemy lines. But I feel that my contribution must be small indeed compared to the probable gift that could be made by the greatest botanist among us—Professor L. H. Hart, who for some strange reason"—the man's voice dripped acid—"has not chosen to speak."

There was a hush. Farrell looked from face to face.

"Professor L. H. Hart," he said at last.

There was no answer. Farrell's white lips compressed.

"Not present? What scientist dares not to answer the call of his race?"

"Professor Hart is present," came a calm, sweet voice. "But Professor Hart does not care to participate in plans of war."

An almost physical shock rocked the house. Every eye turned to the person who was an eminent scientist and at the same time a beautiful woman.

She got up slowly, tall, Junoesque, striking in her plain white tunic.

"I came tonight," she said, "hoping to find others like myself: scientists who would refuse to lend their intellects to mass murder. I find none. All are ripe for war. So I shall stand alone. President Farrell and others of the High Command, I refuse to lend my few achievements to the purpose of destruction."

There was pandemonium. Then Ryder Storm of the flaming beard leaped up.

"One moment all! I believe Professor Hart, in her disappointment at the bloodshed any woman would naturally

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hate, is speaking words she does not quite mean—"

The woman's soft voice cut in impersonally.

"My thanks to Professor Storm for his championship. But my words were final. I refuse to act in violence. With the permission of President Farrell, I shall leave now."

With the grace of a girl, she moved calmly to the nearest exit. Names which no scientist should know were howled after her, but her cool face showed no sign that she heard. The exit door closed behind her and a dozen men leaped to their feet.

"Stop her!"

"Jail her as an enemy alien!"

"Make her cooperate!"

"We fight for our lives—and she refuses aid!"

Farrell's upraised, weary hand forced silence.

"You don't force women, even great scientists, to your will. Anyway, you couldn't force this one! I know Professor Hart. Rack and fire could not break her will."

His tired eyes rested on Storm's blue-blazing ones. He beckoned. Storm, red-bearded and red-tempered, a gorilla of a man with the brain of a genius, came to the platform and the president spoke briefly to him. . . .

IN THE black night, over a darkened city, a stratosphere midget flung itself westward, with Laura Hart at the controls. After it came Storm's fast ship. The first sky-louse, as the small fast vehicles were called, showed lights, then sounded the secret code which cleared a sector of the electronic barricade. It flashed through, followed by the second sky-louse, and crossed the Mississippi at eight hundred miles an hour.

It cleaved the darkness, as its pursuer cleaved it, until the far-flung Rockies showed ghostly in the night. Then it hurtled toward a small flat space on the edge of a precipice.

It looked like a natural table-space, and the cliff behind it looked unbroken. Actually it was a minute landing field and cunningly concealed in the cliffside was a portal large enough to take the little ship in.

Laura Hart gauged space beneath her by the Geigen meter which bounced black light down and measured its rebound. She came to a perfect landing and jumped from the ship. Storm was already down. He got to the cliff portal ahead of her.

The woman faced him, cold, still.

"Let me pass," she said quietly.

Ryder Storm stood aside, but followed after her into the slowly opening cliff door. In a garden as lush as though grown in the tropics instead of in a cave where no sunlight ever penetrated, he caught her arms and made her look at him. A great bush loaded perpetually with blue roses drooped beside them.

"Laura! You've got to listen to reason. What you said in council was unforgivable. You'd have been mobbed if it hadn't been for your great name."

She only looked at him, serene and cool as the northern snows. Storm shook her in his exasperation.

"You don't seem to realize what this war means. It is the white race or the yellow! One must die. Perhaps both, with Earth a ruined ball, if the war can't end soon! And the only way it can be ended is by quick victory. For us, please God!"

"I will not join in war," said Laura Hart.

"You must! The white race needs your brain."

"No."

"For the sake of the race—of the world—"

"No!"

"You would see human beings die by the million when some great discovery of yours might just possibly end the war in a week? You would see Earth reduced to savagery?"

"Yes."

"You mean that?" Ryder said hoarsely.

"I mean it. I don't care what happens to humanity."

Storm drew a great breath. He released her arms.

"I can see that my presence here is futile. I had hoped our long companionship would mean something.

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Good-by."

He turned. Laura looked after him with unaccustomed color in her cheeks.

"Ryder—"

The big man turned quickly back.

"Well?"

"I don't usually explain my decisions," Laura said. "But I don't like to see you go away looking—like that. So I will, to you."

"I can guess," Storm snapped. "You're a woman before you're a scientist. You're a milk-and-water pacifist. You'd rather hide here—until an Oriental squadron blows your mountain down—and play with your silly flowers, than help humanity."

THE woman shook her head.

"That's not the reason. I am unconcerned with humanity, Storm, because I have recently discovered that man is in the twilight. His rule is almost over. He shall die out anyway. And my knowledge of that makes me indifferent to his present fate."

"How do you know? Can you read the future?"

"In this one respect, I can," said Laura calmly. "I know man is about done, and I know the form of life that shall replace him as Earth's ruler. Would you like to know, Ryder? The life that shall supplant his is the life you have just ridiculed. My silly flowers might eventually rule the world!"

Storm stared open-jawed.

"You're mad!"

"Am I? You shall see what no one else has ever been shown. You shall see the peaceful, calm, kindly form of life that is going to take humanity's place. No more wars, Ryder. No more stupid bloodshed. It will be a better world when humanity has finally destroyed itself. A peaceful, lovely world with no greed or destruction in it."

"Mad," whispered Storm, his big body seeming to shrink.

But the woman only smiled. "You shall see."

She beckoned to a man in mechanic's clothes. "Roll the two ships in, please. And then instruct the others to see that I am not disturbed for the next hour."

She led Storm through the marvelous subterranean garden to a great metal door, which she opened with code and combination key.

"No other eye but yours has ever seen my secret laboratories, Ryder. No other eye ever shall."

"Unless you decide to work with the High Command against the warring yellow men," said Ryder.

Laura Hart's shoulders rippled.

"Small chance of that! I prefer peaceful flowers to bestial humans."

Storm's first impression in the great room behind the metal door was one of color. Green predominantly, but splashes also of every other color.

His next was that he seemed to stand in the midst of a green and turbulent sea which surrounded but did not envelop him.

His third was a realization that he stood under a different kind of light than any he'd ever seen before, and a sense of sublime well being.

Then he began to note details.

The walls of the big chamber were lined with large glass tanks. In each was the flashing color, the rhythmic movements that made him feel that he was in a varicolored ocean.

He stepped toward the nearest tank, in which was the one color, green.

He saw an undulating surface halfway up the tank. It moved regularly, up and down, taking about three seconds for each rise and fall. Up, a brighter green; down, darker and duller; up again. Like a heaving little pond.

In the bluish radiance of the locked laboratory, Ryder felt a tendency to shiver. The tide in the tank had no meaning for him, and thick glass was between him and it. Yet he felt the subtle presence of danger.

HOWEVER, Laura didn't seem to feel that way. He looked at her, and went to the next tank.

In here was color, purple, flashing on and off and rising up and down as the green stuff had, with a cycle lasting only a few seconds.

Then he started, for here the nature

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of the heaving stuff was coarser and he could distinguish its broad flat particles. Those particles were leaves. Plant leaves!

Up they swelled. A purple blob—a perfect flower—crested each. Then, like a bubble bursting, the flower drooped and withered. Up and down, like tides in the ocean. Like waves. Only the waves were growing and dying plants!

"In the name of heaven—"

"Evolution," said Laura Hart. "Growth and death in the span of three seconds instead of a full summer."

"It actually looks like that. But it *can't* be!"

"It is, Ryder. Years ago I learned to speed up life. I did it with plant life by irradiating peat moss beds and the surrounding air with super-violet rays from the lamps overhead, and by constantly forcing into the growing-beds a mixture of nitrogen, oxygen and phosphates which is my own secret formula. That forced the growth faster and faster, culminating in these beds where an entire plant generation lasts a bit less than three seconds."

"Three seconds—from seed germination to death and decay?"

"Exactly. Nearly a million generations in a year. You see the future vistas revealed by that. In a year I can see plant evolution as it will take place in the next few hundred thousand years. I know what plants will be like a half million years from now. And there is one plant—"

Laura Hart's voice was dreamy. Prophecy was mysterious in her blue eyes.

"There is one plant which has evolved most powerfully and successfully under my forced feeding. The plant that shall rule the world! At the period in its evolution in which it is most perfect, I stopped the forcing process so that now specimens grow naturally as they will in the far future. Come, you shall see them."

She led Storm through the laboratory, to a second door. He looked from side to side. Here was a tank in which a flower new to botany produced a reddish bloom as large as a pumpkin every three seconds. There was a thing like a barrel which opened a veined lid like a trap yawning, closed it as flashing death struck it, sagged to the peat moss bed, then grew green and tall again. There were perennials too: plants taking longer than a season to grow. These mushroomed in three-second spurts until they were tall trees, dropped fantastic blooms, then died again.

"Plants as rulers of Earth," Laura Hart said softly, as she unlocked the inner door. "Flowers as overlords. There will be peace when human beings are gone. Plants have no greed for power, no instinct for murder. They do not kill as men do."

Storm was awed by this woman who had gone as far in botany as he had in bacteriology. But he couldn't let that pass.

"A world of cabbages!" he snorted. "Peace? It will be the peace of a turnip! I'd rather be ruled by bloody despots than by milkweeds!"

He stared curiously at her.

"You know," he said in a different tone, "I'm wondering if this sweet future world of yours will be as serene as you think! It may be that some law of survival of the fittest will hold true even then. There are warlike plants, you know. And all will fight for the root-spread that means their existence."

LAURA smiled. The smile made Ryder's hands clench. It was so unmoved and impersonal. If he could only reach this woman—hurt her—do anything so she would become a human being instead of a pacifistic thinking machine!

"I have worked with plants all my life, Ryder. I know them. Animals, including man, are vile and murderous. Plants are clean and placid. But you shall see."

Storm followed her into the inner laboratory, twice hidden by great metal doors from intrusion.

This second laboratory was about thirty feet high and as large as a football field. Its light was different. Looking up, Storm saw that only half the bank of lights were on. There were

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no tanks in here, save a small one nearby which was empty; a temporary forcing bed of some sort no longer used but not yet taken from the big room. The plant life of the place grew from peat moss on the floor, open and unrestricted.

And what plant life!

Each plant was twelve to fifteen feet tall and as large around as a man's thigh. Its upper half was a naked stalk crowned with a blazing orange bloom as big as a hogshead.

A forest of the things stretched from door to far wall of the secret laboratory. And though there was no breeze in here, they swayed a little as though imbued with animate life.

"The common day-lily," said Laura Hart. "At least it was the common day-lily a million generations ago. Now it is as you see it—the probable future ruler of Earth."

"The sweet flower king, eh?" growled Ryder. "But I don't believe it. What are these things, after all, but overgrown yellow flowers? Any beast that browses can cut them down. There may be evolving insects to kill them. Or man—the scientist of the future—can find ways to annihilate their whole species."

"Insects?" smiled Laura Hart. "These plants have developed sap that is poisonous, searing. Man? If humanity doesn't decimate itself in war, it will refuse to work together—as always in history—until too late. Beasts? They can't harm them unless they develop higher reasoning powers than these flowers possess."

Storm stared at her.

"You mean to say—these vegetables can reason?"

"Yes. They can. They possess intelligence, Ryder. I don't profess to know what kind, or what sort of nervous system produces it. But they have it. And experiments prove that they are occasionally mobile; they can move from place to place as animal things can. That means they could move from dry spots to moist ones, from barren ground to fertile."

She stopped and frowned.

"That's odd," she said, looking down between rows of enormous, weaving flower stalks. "There was a bed of giant peonies in here. I don't see them now."

"They may have evolved right out of the picture," Storm grunted.

Laura took the sentence seriously.

"No. I stopped the rapid growth-span of these plants at this perfect stage. The proper chemicals are in their peat moss bed, but they must have the violet light for rapid evolution."

She pointed upward.

"As you see, the violet ray tubes are not on. Only ordinary sunlight tubes. So the peonies could not have completed their evolutionary span while I was away—"

AGAIN she stopped. Her eyes widened.

"Ryder—something is wrong in here! I can feel it—"

"Yes, I think something is!" Storm exclaimed. "And I think I can tell you where your peonies are! Look!"

He pointed to a great plant. The big yellow bloom was closed. But from the tight-closed rim a wilted green length trailed. It was like a vine tendril trailing from the mouth of a tightly closed sack. Or like the tail of a small serpent protruding from the swallowing jaws of a larger, cannibalistic one!

"Your sweet flowers," Storm said grimly, "your beautiful plants which will some day make this a better world—seem not to be so peaceful after all. There goes the last of your peonies. The lilies have devoured them!"

Laura's hand was at her throat. Her face was like death, as she saw the limp roots of the lesser plant slowly and grimly drawn into the beautiful bloom of the larger.

To her this was supreme tragedy. For half her life she had built her ideas on the thought that some day the world would be governed by things of peace—plant-things among which there would be none of the wars and destruction practiced by humans. She had dreamed of a brighter, better day; and, dreaming, she hadn't cared in the least what happened to humankind including herself.

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And now—one species of her super-plant had warred on another! Had warred and won, and devoured the losers!

Storm, guessing her tragic thoughts, took her hand in his.

"Don't feel like that," he said gently. "You're a great scientist, but you've made the mistake so many pacifists make. That is, to ignore the rule that life is a battle. Nothing lives that doesn't have to fight something else for its life. In your future, which turns out to be not so sublime after all, the lilies are crowded by the peonies, so they war on them and the war can only end in the extinction of one or the other. In the present, the yellow race feels crowded by the white, so there is a war that can end only in—"

He stopped. His hand tightened over hers.

"What is it?" Laura asked apathetically.

"The door. Look toward the door."

Laura turned. Slowly the desperate disillusion in her eyes was replaced by an emotion that had nothing to do with intellect: the emotion of stark fear.

Between them and the door, where there had been a wide, clear aisle, there was now a weaving triple row of gigantic day-lilies!

"Ryder! What does it mean?"

Storm had his arm defensively around her shoulders.

"The things have surrounded us—to give us the same fate as the peonies! It means they're so warlike that they'll attack anything moving and living within their range!"

"But it can't be! I've been in here many times before, alone, and they haven't acted like this."

"Probably because they were weakened and dull from too rapid growth. You have now slowed their growth to normal, and they have gathered normal strength—and mobility!"

He stared at the nearest lily, nerves crawling in his body.

The roots of the thing were slowly withdrawing from the peat moss. Like bloodless worms creeping, they came out of the bed; and when they were bared, the plant they supported moved teeteringly toward them.

NEAR the door the lily stalks all stood on exposed roots. They joined in the slow march toward Laura and Storm.

Intelligence? Yes, they did have some sort of intelligence. Must have it! Only reason could have made them move between the man and woman and their one way of exit.

"They're coming closer—" whispered Laura, primeval fear in her eyes. "What can we do?"

"Have you an ax?" asked Storm, keeping his voice calm.

"Not in here. There are some in the general living quarters, but there are two locked metal doors between us and them. We can't get out because of the lilies. Help can't come to us because of the locks—"

All the great flowers had their roots exposed now. And all were advancing, rank on rank, closing in on the two.

"I'll try to get to the door," said Storm, with his forced calm. "These things can't be able to move fast."

He walked toward the front rank of the plant-things that had got between them and the exit. He leaped forward, big arms driving to tear a way between the stalks.

Like a flash the nearest stalks whipped down. Green tentacles coiled around his arms and body.

"Ryder!" screamed the woman.

But Storm was only too desperately aware of what had just happened. With their swift moves, the plants had dropped the big flowers from their stalks. Like giant toads, the blooms hit the moss-covered cave floor with a dreadful soft plopping sound. But they did not lie there.

With the instant of their landing, they began to move on weaving fringes toward the big red-bearded man.

"Ryder—"

One of the separated blooms enveloped him to the hips. Its curling, lovely cup sucked tight. From sections of its vast rim came slow trickles of some sort of digestive acid.

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Sweat beaded Storm's forehead. The muscles of his arms and barrel chest writhed as he fought to tear free. Death stared at him. Then, with a cracking of shoulder tendons, he wrenched his arms from the green coils. He fell back over the blossom that had clamped his legs together, and rolled away.

Laura ran to him. With raking nails she clawed at the ferocious flower cup. Its walls were thin but tough, like orange-enamelled patent-leather. They defied her hands. But some of the rim reached hungrily for her, and with that slight lessening of the deadly grip, Storm tore free.

His eyes thanked her for the help—probably the first destructive move she had ever made. But he only said jerkily:

"That tank! Run, before they cut us off from that too!"

Behind them was the glass experimental tank, noted before by Storm. Empty, unused, it offered a forlorn haven.

A whipping stalk looped down before them as they ran for the tank. The flower dropped from it, to plop on the moss and start inching toward them. Storm seized the thick stalk and wrenched at it. He did not succeed in tearing it in two, but the whole plant shivered and jerked back, leaving the way clear for a few seconds.

THE tank had a glass top as well as glass sides. The top was hinged, a glass lid. Storm lifted it up.

"In, Laura!"

The woman climbed in. Storm slithered after her. The lid banged down.

The two stared at each other with eyes in which horror was only a little lessened. The tank was a haven for the moment. It would probably be their coffin in a little while!

Moving with amazing quickness on their wormlike roots, the giant stalks had surrounded the tank. On all sides, the big orange blooms crawled toward the glass, separated from their stems. They piled up around the case, sucking at it with acid-dripping rims, trying to reach the two. And then they proved again that they were able somehow to see and reason.

These two creatures had entered the glass case through an uplifted lid—promptly the tough stalks felt along the top to lift the lid, too, and get in to them!

The blunt, flowerless end of one of them found the overhang of the lid. It moved up, with the lid opening as it moved.

"We'll fix that," Storm said thickly.

He motioned Laura to the side of the case on which was the lid hinge. He leaned powerfully against the glass wall, and she added her weight to his. The glass tilted, fell on its side. The green coil which had entered was wrenched out by the movement of the case. Again—and the glass tank lay on its top, sealing the lid shut with its own weight.

"They can't get in now."

No, they could not get in. But neither could the two victims get out!

Storm exclaimed suddenly. His clothes from the waist down were beginning to smoke. The skin of his legs felt as though bathed in liquid flame.

The digestive acid dripped by the first flower cup was eating in.

He tore the garments from him, then ripped off the tunic of his shirt and wiped the deadly stuff from his legs. He straightened, big torso bared from the waist up, and his breath hissed between his teeth.

Flower cups were clustered against the glass tank like bees on honey. From each dripped the viscous stuff they secreted for absorption of victims. And under the slow drip of that stuff the unbreakable glass was turning milky—and was pitting!

"They can actually disintegrate glass!" Storm exclaimed. "See those pits! They'll be through in an hour or less!"

Laura Hart nodded in a dazed sort of way. Her eyes were filled with despair.

"We're going to die in this tank. We're going to be killed and eaten—by the creations I thought so peaceable and superior to humanity."

She began to shudder, almost

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rhythmically. Storm held her close.

"We're not dead yet."

Then he thrust her from him. He cursed deep in his throat, at himself, curses that sounded like prayers.

"What an idiot! There *is* a way—"

HE caught Laura's shoulder.

"Where is the switch controlling the overhead ultra-violet-tubes?"

"The violet-tubes?" repeated Laura.

"Yes. Listen—You said you had slowed the evolution of these damnable things by shutting off the violet rays overhead."

Laura nodded, eyes mystified.

"All right. Suppose we could switch them on again. The rapid growth-span of the plants in here would be resumed, wouldn't it? They'd pick up their quick progress in evolution wouldn't they, with each plant dying and being replaced by a new plant every three seconds?"

"Yes. But—"

"In human beings," Storm said swiftly, "there is such a thing as race memory. Recollection of an event is handed from one generation to the next. But eventually that recollection gets lost in the mists of time. Now, these things are attacking us, eager to devour us. But if their growth-span were quickened, the attackers would die in a few seconds, the next generation would not be so keenly aware that we are a trapped enemy to be overpowered—and as each generation succeeded the last and the race memory died out, that awareness should fade. Don't you see?"

Hope flamed in the woman's eyes.

"You mean they might forget what they are fighting for?"

"Exactly. Just as in a thousand years of war men might finally forget who had started a fight against whom, and why. Besides, the rapid evolutionary process can't help but weaken the plants. Laura, where's that switch?"

Hope dulled again in her sea-blue eyes.

"It's over on that panel." She pointed toward the wall of the subterranean laboratory forty feet away. "We can't possibly reach it. There are dozens of the things between this tank and it."

"But we can reach it! We can get to it simply by rolling this tank over and over toward it. We rolled it over on its top to clamp the lid shut, didn't we? Then why couldn't we roll it some more—to reach a definite goal?"

"Ryder—" Laura's fingers bit into his arm. "I really think we could. But if we can do that, why not simply roll to the door and escape?"

"Because the door happens to open inward," Storm said. "We'd have to stop so far from it, to let the opening door clear the tank, that these hellish plants would have room to get in between and block us again. This side, Laura. Add your weight to mine."

They surged against the glass wall facing toward the distant control panel. The glass tank tottered on its edge and fell on that side, pinning down some of the coiling green stalks, and pressing flat the separate blossoms there.

"Watch the lid!"

The maneuver was repeated, and they were ten feet nearer their goal. Two great plant stems looped viciously upward with the now exposed glass lid of the tank.

"Again!"

THE tank rolled on its side, carrying the reaching plants before it.

"We're going to make it," panted Laura.

No one who had ever seen her as the cool, impersonal, detached scientist, or the passionless, inflexible pacifist, would have recognized her now. Her tunic was rent. Her eyes flamed with the primitive urge to preserve life by any means against the attack of aliens.

"Yes, we'll beat the things yet!" grunted Storm, straining for the next roll of the tank.

They got to the panel. And they landed next to it with the lid underneath instead of on that side!

"Ryder— We can't reach the switch after all—"

"Yes," Storm ground out, "we can! But heaven help us if the race-memory of these things can persist

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through the generations so that they keep on attacking us. Because the only way to reach that switch is through a loophole that will let the things get in!"

He stooped and caught up the ripped strips of his shirt tunic, which were blackened and rotten with the acid he had wiped from his legs. He wound them unheedingly around his big right fist and turned to the glass tank-wall next to the control panel.

The glass was deeply pitted. Opaque from the dripped acid of the deadly flowers. He drew back his arm and crashed his fist against the section most deeply pitted.

A sledge-hammer couldn't have cracked that glass had it been untouched. But the viscous stuff from the blooms had done fantastic damage to the molecules of the glass. With Storm's first blow, it buckled out a little. With his next, delivered with all the power of his big body, his fist went through.

Like furious serpents the green coils of the plants' stems writhed to fasten around the arm Storm shoved through the hole. But his hand got to the switchboard. He shoved home the switch controlling the overhead violet ray tubes, and saw with the move a slight change in the tint of light streaming down from overhead.

Literally holding their breaths, the two stared out through portions of the glass wall that had not yet been etched to opacity by the acid.

And they saw the miracle of the outer laboratory repeated.

Here, as there, the plant-growth of a season was compressed into a few seconds. On all sides of them the giant day-lilies drooped, fell to the ground, decomposed there as another crop swelled to maturity and in turn died and decomposed.

But each upspringing generation of plants reached savagely for the glass tank! With each flashing maturity, long stems crowded to get into the hole Storm's fist had battered, and deadly blossoms sucked at the glass walls and dripped their corrosive acid.

"We're beaten," Storm said.

The two crouched in the tank, away from the tentacles ever writhing through the hole. But then a shout came from the man's bearded lips that almost burst their eardrums in the confined space.

"We're *not* beaten! Look!"

OUTSIDE, the surging plant-things were no longer striving so hard to penetrate the glass tank. With each quick upthrust the swelling green plants moved more indecisively, and their roots went down more solidly into the peat moss. Meanwhile, the blooms had almost ceased to move toward the thin walls protecting the man and girl.

"Whatever method they have of passing history down to their descendants is failing!" cried Laura. "A hundred generations have passed. Now the new generations are losing the race memory and forgetting to fight us!"

Storm held her close and watched with her, eyes shining, red beard flaming in the queer light that was saving them.

And the time came when no stalk coiled toward the hole in the tank, and when no fallen flower inched in that direction. There was only the fantastic sea of vegetation—levelling to the ground, spiring up like a solid wave, bursting into bright orange bloom and then sinking down again in death.

White-faced, Laura and Storm took the gamble. They rolled the tank back and stepped out of it as the lid fell open.

The near plants bent vaguely toward them, like arms reaching, then shrank back as they swelled to maturity and shrank into death. But the move had in it no hint of attempt to finish a struggle almost won by distant forbears; it grew only from the innate ferocity of the things Professor Laura Hart had cultivated from ordinary flower plants through infinitely accelerated evolution.

They got to the door, stepped into the other laboratory, and locked the menace of the inner laboratory behind the massive metal panel.

[Concluded on Page 129]

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Science Questions and Answers

THIS department is conducted for the benefit of readers who have pertinent queries on modern scientific facts. As space is limited, we cannot undertake to answer more than three questions for each letter. The flood of correspondence received makes it impractical, also, to promise an immediate answer in every case. However, questions of general interest will receive careful attention.

DO THE BLIND DREAM?

Editor, Science Questions and Answers:

Can a person born blind visualize images of things in his sleep?

H. M.
Martinsburg, Mo.

Yes, a blind person visualizes images in his sleep. If the person has not been born blind, he often visualizes images and objects which seem to him to be concrete, and which seem identical with those objects he has known and seen during the days when his eyesight was not impaired. Even those blind persons afflicted since birth often visualize things in their sleep which seem to them real, and which they seem actually to see. These objects are not always correct in detail with those which the seeing person knows. If we permit a blind person to feel an object, his description may be erroneous, because he was unable to associate in his mind its shape, unless that shape were simple. He is likely to dream of that object as he thinks it appeared to him.

Some blind people, when they dream, only seemingly make use of those senses during their dreams over which they have control, and they may dream of feeling an object, smelling it, or tasting it, but rarely visualize that object.—Ed.

EINSTEIN'S THEORY

Editor, Science Questions and Answers:

Having heard so much about Einstein's theory and its complexities, I wonder if you would give me a simplified account of it?

W. J. B.
Rochester, N. Y.

In summing up Einstein's theory, we find that it rests upon the following novel ideas, and combines them into a new conception of the Universe.

(1) There is nowhere any fixed standard by which the motion of anything can be measured. The theory of stationary ether is put out of court.

(2) The speed of light alone is independent of all other motions, and is the same for all observers, everywhere.

(3) Time is not independent of space, or of motion. If two objects are in relative motion, both time and length, as observed from either object on the other, vary with the ratio of their relative motion or speed, to the speed of light.

(4) Time plays the part of a fourth dimension, as combined with the ordinary dimensions of matter (length, breadth, height or thickness) that together make up a "continuum," or continuous, inseparable medium, called space-time.

(5) Space-time is different in its structure from what we ordinarily think of as space, and ordinary geometry does not apply to it. It has an internal warp or curvature, which is greatest near massive bodies.

(6) Gravitation is not due to an "attractive force" but is simply a natural consequence of the "curvature" of space-time.

(7) At least two important physical confirmations of the Einstein theory have been found: first, the observed bending of light during eclipses from stars passing close to the sun, which Einstein predicted as a result of the peculiar structure of space-time; and second, the slow swinging round of the perihelion point of the planet Mercury, an effect that the Newtonian theory of gravitation does not satisfactorily explain.—Ed.

HEREDITY

Editor, Science Questions and Answers:

I wish you would enlighten me on the following questions which have puzzled me for a long time: What is the reason that most European people are white-skinned, the African black, and the Chinese yellow? Is it true that the so-called white people have benefited more than any other race in evolution, in social or intellectual positions? Will the North American Negro in time become equal in color and brains to the White North Americans?

A. B.
Brooklyn, N. Y.

The questions which you ask are rather difficult to answer, and of course open to constant scientific discussion and dispute. There is probably no more reason why the Africans are black, the Chinese yellow, and the Europeans white than there is why one collie is brown, another white and another mottled. The process of selection, atmospheric condi-

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tions, climate, inherited and acquired characteristics, and perhaps above all, the sun, had much to do with this in the evolutionary stage and preceding that, a change in the ancestral stock may have been the prime cause. The original stock was probably of yellowish tint. Living under the tropical sun, man becomes quite dark-skinned. Should he bring up children in that region, those children become dark-skinned.

Should there be marriages between the darker groups, it is possible that every fourth child might be fair, whereas the others might be dark. If the dark intermarried with dark people the strain of darkness may be maintained. If one of those dark children married a light or fair person, the offspring would be either light or dark. All of this deals with the Mendelian theory of heredity, which has been quite well established.

Taking not the individual case, but the mass average, it is quite definitely established that the white race has benefited more than the black in the course of evolution, and that the white race is undoubtedly superior to the black and yellow, in the general average intellect and in general social status.

Your question as to whether the North American Negro "in time" will become equal in color and brains with his white cousin is difficult to answer. "Time" is very indefinite. If you refer to the next hundred or thousand years, the answer is in all probability—no. If you refer to the next million years, or two or three million years, there may at that time be no differentiation in color among the races of the entire world. If yellow races intermarry with the white, the white with the black, etc., and with transportation more rapid, thus shortening the distance between the tropical and frigid countries, it is conceivable that "in time" this world might be of one color and one great family. Wars and calamities might bring this about even sooner. Supposing that the yellow race should suddenly overrun Europe. It is perfectly natural that their white cousins would marry these people. Some children that are then brought into the world would be crosses between the two, some would be white and some yellow. Intermarriage would make for further changes and equalizations.—Ed.

DETECTING GOLD

Editor, Science Questions and Answers:

How can one distinguish between a solid gold object and one that is filled, without resorting to the well-known physics demonstration of the principle of Archimedes?

M. W.
Baltimore, Md.

It is very easy to distinguish between a solid gold object and one that is filled. File a very small notch in the metal and apply dilute nitric acid to it. If there is an effervescence and a greenish tincture is formed, it is safe to say that the metal base is not pure gold.—Ed.

INTERPLANETARY COMMUNICATION

Editor Science Questions and Answers:

I've read many science fiction stories in which communication with other planets is accomplished by means of radio. Now while I do not say interplanetary communication will ever be accomplished, I do say that the magnetic radio will never do the job.

It will be just as impossible to communicate with other planets with magnetic radio as it is to talk across the ocean through a wheat straw. We must have a different tool than magnetic radio to have interplanetary communication. At present it looks as though light radio is the only hope.

The magnetic lines of force are limited in number and extent. The farther away from the earth we get, the less number of lines of force there will be until there are not any. At least a magnetic radio wave, as we know it, would not travel on such few and far between lines of force.

L. E. Y.
Trenton, N. J.

While you have advanced some arguments concerning the impossibility of interplanetary communication by radio, you have given no reason for these arguments, nor have you based these arguments on scientific reasoning.

The amount of energy actually transmitted into the air by any of our modern broadcasting stations is quite minute. A five-watt station, transmitting on short waves, has been heard in Australia consistently. The individual doing the transmitting was located in Chicago. With this five-watt transmitter two-way communication was quite continuous. We can reasonably predict that if 5 watts can send a message 10,000 miles, ten watts in energy should be able to do half again as much. There is, therefore, nothing in the way of communication with Mars, or any other planet, unless it be the Heaviside layer, which apparently reflects radio waves.

On the other hand, unless the Martians, if such people exist, are familiar with our methods of radio communication, they also would be unable to receive messages unless they had eyes; and unless they also had telescopes, they would likewise be unable to see any light signals which we may send. If they are further advanced than we are along the evolutionary scale, then they may know that this Earth is inhabited and they are probably aware of every effort which we may make in attempting to establish communication. It is probable that their telescopes are so powerful that they can pick out a spot as big as a city block and observe the people thereon.

You must remember that a radio wave does not require any magnetic lines of force on this earth for its transmission. This wave will penetrate an area entirely shielded from the earth's magnetism. Magnetism and electricity in accordance with modern scientists' opinions, have practically no weight. With a powerful magnet, you can do a lot of attracting and repelling, or with electrical charges you

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can do likewise. But there is much difference between charges and weight. Inasmuch as both magnetism and electricity are electronic forces, the weight of magnetism depends directly upon the number of electrons present. Each individual electron weighs .000,000,000,000,000,000,000,000,000,089,7 grams.—Ed.

EXISTENCE OF ETHER

Editor Science Questions and Answers:

If there were no ether, would we have daylight? If a searchlight were placed in a large glass tank, and the air exhausted, would there be a beam of light emitted?

S. E. L.
Ridgefield, N. J.

Light is theoretically transmitted by vibrations in the ether which are supposed to exist. It may be well to recall to your mind that an ordinary electric light bulb has its filament in a vacuum (ether exists there, however) so as to prevent its oxidation or burning up. Presumably without ether, there would be no light.

Placing a searchlight in a glass tank from which the air has been exhausted would have no bearing or effect on the light emitted from the searchlight. However, what you may have in mind is that sound will not be transmitted without the medium of air or some material substance.—Ed.

LOCATING SUNKEN SHIPS

Editor, Science Questions and Answers:

Can you give me a summary of the various practical methods for locating sunken ships?

M. O. D.
Milwaukee, Wisconsin.

There are several methods for locating a sunken vessel. The first is the induction balance method. Sound ranging is another fairly good system, but in this and the first named method you meet with a great many difficulties. If the bottom of the water bed is irregular, then the sound waves reflected from the bottom may be like those which would be reflected from a sunken ship and a mistake may be made.

Another system would be to drop an insulated cable to the bottom between two vessels and drag this along until it strikes some object, measuring the distance between the surface and the electrode at the bottom. It is evident that if this contact at the bottom of the water should strike a large body, the resistance will be immediately decreased. Such is the case if the objects were of relatively large size and the contact made were quite perfect. Here again the system would have to be developed rather fully before one could look upon it with any degree of favor.

There are two remaining methods which could be employed which will give quite accurate results. The first is a device similar to a diving bell, and the second a deep sea conveyance of either the Williamson or Lake types. The submarine camera may also be effective. Sound ranging from shore stations or the Fessenden method of ore location could perhaps also be used, but none of these devices is positive in action, and much experimental work would have to be done before they could be practically employed.—Ed.

BODY CHEMICAL ELEMENTS

Editor, Science Questions and Answers:

To close an argument, will you please state the number of chemical elements known to be contained in the human body?

A. R. L.
Chicago, Illinois.

The elements found in the human body are generally in combined forms. There are traces of bromine, copper and lead. Arsenic is present to the extent of a little more than three one-hundredths of a grain; aluminum about 15½ grains; silicon, 46¼ grains; manganese, 46¼ grains; iron, 77 grains; magnesium, 1¾ ounces; fluorine, 3½ ounces; sodium chloride, 8¾ ounces; phosphorus, 28¼ ounces; calcium carbonate, 3½ pounds; potassium nitrate, 2¾ ounces; sulphur, 3½ ounces; carbon, 44 pounds; ammonia, 4¼ quarts, and water 84 pounds.—Ed.

CHLORINE

Editor, Science Questions and Answers:

Since chlorine is a poisonous gas what uses does it find in our everyday life?

E. Y.
Albany, N. Y.

Chlorine, a greenish yellow gas with a very disagreeable odor, is used mainly in the manufacture of bleaching powder. Being a very active element, it decomposes many elements, to form more stable ones.

Ordinary salt is composed of sodium and chlorine, yet it is beneficial instead of being harmful to ourselves.

As a disinfectant, chlorine is one of the most powerful.—Ed.

BLACK FOG

Editor, Science Questions and Answers:

Can you give me some information concerning black fog and the cause for its formation?

R. F. E.
Atlantic City, N. J.

This form of fog occurs in cold weather over the open surfaces of rivers. Winter fog on the comparatively warm water of the river always appears when the temperature falls to 11 degrees F. The fog rises in columns and hairlike forms. Black fog, however, only occurs at sub-zero temperature and appears to be a precipitation of heavy semi-fluid water particles which seem to absorb the sun's rays. It is preceded by a white fog early in the morning, which is known to rise upward to a height of one thousand feet. When the sun rises, the white fog disappears and the color changes to yellow and then rapidly to an opaque black. It is the action of sunlight which causes this transformation. The white collodial particles are changed to a deep, heavy form.—Ed.

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FIVE hundred years ago a young astronomer, Galileo, looked through a home-made telescope and probed the riddles of the Cosmos. To this awed scientist's gaze were first disclosed the four moons of the planet Jupiter, and his clear mental vision saw in that planetary system a true miniature of our Solar System itself—an ocular demonstration of the Copernicus plan of the Universe.

After Galileo came the first of the later great astronomers, Sir Isaac Newton. Newton, by his transcendent powers of mathematical analysis, elevated astronomy to its true position among the exact sciences. Newton's conception of the Universe makes all phenomena of motion subject to a single law—the law of gravitation.

OTHER GREAT ASTRONOMERS

Then followed other great astronomers, men who charted the constellations, wrested the secrets of the heavens from the Universe. Euler, Clairaut, D'Alembert, Lagrange, Gassendi, Roemer, Flamsteed, Bradley, Edmund Halley, Sir William Herschel, Bessel, Joseph Leverrier—these are some of the men whose names stand out as milestones in the history of astronomy, men whose names will be as permanent as Change itself—the only permanent factor in the Universe.

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So it is with great pleasure that we are announcing the publication of a brand-new article on astronomy in our next issue, by the dean of modern astronomers, Sir James Jeans.

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I am enclosing a stamped, self-addressed envelope and the name-strip from the cover of this magazine (tear off name-strip so that the name THRILLING WONDER STORIES and the date can be seen). You will send me my membership certificate and a list of rules promptly.

12-37

CHAPTER NEWS AND GENERAL ACTIVITIES—LOS ANGELES

Attendance record smashed! Topping by 5 our previous peak of 24, all-time high of 29 turned out to see and hear scientifantasy celebrity Dr. David H. Keller, honorary guest speaker at Chapt. 4, evening of Aug. 19. For over 2 hours Dr. Keller engrossed his audience with amazing true tales. A detail account of Dr. Keller's diverse anecdotes, fantastic facts revealed, opinions expressed (one astounding prediction in particular), advance info on his forthcoming fiction ("The Laughing War" in Esperanto edit., etc.), is featured in issue No. 1 League's LA organ, gazette produced principally by guild of this city's scientifantasy fans.

Mort Weisinger, of the staff of T.W.S., flew to west coast quite recently. As he wasn't to remain sufficiently long to attend regular meeting, rush arrangements were effected by Hodgkins and Ackerman; with cooperation Henry Kuttner, special conventionette created at HK's residence where roomful of fans met him. Anxious to oblige, we found Weisinger ready to answer any queries regarding T.W.S.

We were gratified by news T.W.S. soon'll feature scientificontest suggested by LASFL, encouraged to hear of further features in store, and to learn that the League to become increasingly active. A résumé of the major remarks culled from X-questioning Weisinger among "Esperantest", Dir. Hodgkins, Morojo, Exec. Dir. Ackerman, Hon. Member Olsen, A. K. Barnes, Henry Kuttner, Fritz Leiber Jr. (Yes, son the cinemactor!), young Yerke, & Handvy Clarks—this "interview" in addition to "Kellereport", Fantascience Fiction Flashes, Scientifantasy Celluloid Scoops, Esperantopix, Stf. Book Reviews, Pomes, Fantascience Fun, Popular Science Articles, etc., are presented in our initial (illustrated) issue. Hear also what Hodgkins has to say, and our other localites. Chapter Directors—or individual Leaguers—interested in our enterprise may secure specimen for 10c from T. Bruce Yerke; 660 N. Mariposa, Los Angeles.

Summer certainly season here for influx scientifantasy celebrities and out-of-town fans; Keller, Weisinger and 8 more! Catherine L. Moore —creator the popular interplanetarian "Northwest Smith." (We'd like to see some Moore mss. in T.W.S. incidentally; either featuring her famous spaceman or introducing some typically T.W.S. personality—as Barnes has done with courageous "Gerry Carlyle", "Francis Buck of the Future"!); Unique Tale's publisher Leadabrand of Dinuba, Cal.; author-artist Lundholm, Pasadena, Cal.; Geo. Tullis, fan from Anderson, Ind.; famous fan Roy Asquires II, Glendale, Cal.; Eddy Martz, Jr., Oak Park, Ill.; Jack Naylor, reader from Pomona, Cal.; and—introduced by H. Kuttner—Bob Bloch, "imagimaratist" from Milwaukee. Friend Ralph Milne Farley's personal pal R. A. Palmer's close acquaintance the late great "Stan" Weibaum. Bob, splendid speaker, with provided verbal images these s-f stars (S.G.W., R.A.P., R.M.F.) as well as Wandrei, Kline, and other well known fantasyarnists; told latest on Lovecraftales and Lovecraft letters to be published posthumously, items about Milwaukee Fictioneers, etc. It was an informative address, wittily rendered, long to be remembered. Articles about both Bloch and Moore're skeded for early issues IMAGINATION!

Ackerman recently exhibited over ¼ 100 original imaginative artpieces by Paul, Dold, Mooney, Ferguson, Bloch, Moore, Vodoso. . . .

Revival these fantastic films secured this summer: Supernatural, Bat Whispers, Alice in Wonderland, Crime Without Passion, Scoundrel, Invisible Ray, Phantom Empire.

At our first August get-together, publicity possibilities proposed at extra meeting week before at Dir. Hodgkin's home (where Russ' formidable fantasy files enviously were inspected)—advertising plans to acquire more members for Chapt. 4 completely were considered. Among proposals

(Continued on Page 116)

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THE TIME OF HER LIFE — Cornell Woolrich

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■ This $10,000 prize-winning author has written the amazing story of a very young, very alluring, very ruthless adventuress. Her mother had been the gay and reckless "Grass Widow" whose mad love of pleasure she had inherited. Her life became a veil of deceit concealing wild escapades with rich and pleasure-sated men-about-town until, in the final pages, she is tamed by *the* man. Even at $2 this was a "Best Seller."

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■ The flaming fire of a great and overpowering love in a smashing story that swings the glittering lights of Broadway to the sanctity of the North Woods. A strong emotional heart-stirring novel of a rich roué and his wife and the rugged Big Woods guide who proves more sophisticated than was expected. The frank answer to the question "What does a faithful wife owe an unfaithful husband?" Many $2 editions of this "best seller" were sold out.

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BROADWAY RACKETEERS — John O'Connor

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■ A masterpiece of the Main Stem by the Bernard Shaw of Broadway. You get both sides of the racket, plus the laughs and lusts of the racket mob, told in the jargon of Racketland. Never before has Broadway artifice, in all its phases, blazing with illicit loves, honeycombed with intrigue, teeming with swift-paced lives, been exposed to the light as in this volume. Real life characters with authentic data exactly as originally sold in its $2 edition.

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(Continued from page 114)

(which may be utilized beneficially by other branches) were Morojo's of inexpensive but effective glass-mats with name, location, and meeting dates painted, to be placed atop imaginative mags on racks; H. Clarks' of papers to be posted on school bulletin boards.

Our Librarian Roy Test today has received from our secretary pep talk about our Chapt. 500-1000 s-f announcements to be distributed to members, to be inserted in the imaginative mags of the great L.A. major newsstands which'll cooperate and also be put in copies in the principal back no. stores in downtown district & H'wood, Bev'y Hills, Glendale and similar suburbs. Idea is: Person who isn't aware yet of our branch buys mag., notes notice about activities of pseudo-science programs and such, invitation urging immediate investigation, earliest possible participation!

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NEW YORK CHAPTERS

FLUSHING CHAPTER

The first meeting of the FLUSHING CHAPTER of the SCIENCE FICTION LEAGUE was held last July, with Robert G. Thompson, Richard Wilson, Jr., (Editor of "The Atom"), James V. Taurasi, (Editor of Cosmic Tales Quarterly) and Abraham Oshinsky among those present. With its second issue the fan magazine, "Cosmic Tales Quarterly," becomes the official organ of the FLUSHING CHAPTER. It will contain stories and articles by prominent science fiction fans. Readers interested in this Chapter should get in touch with James V. Taurasi, 137-07 32 Avenue, Flushing, New York.

THE WASHINGTON HEIGHTS CHAPTER

Chester Fein announces the formation of the WASHINGTON HEIGHTS CHAPTER of the SCIENCE FICTION LEAGUE. Its officers are: Chester Fein, Pres.; George Feinman, Vice-Pres.; Cyril Kornbluth, Secretary; Russel Harp, Treas. The charter members are Franklyn Schwartz, Stanley Egert, Bons Ellison, Arthur Ellison, Harvey Jelley. Readers residing in the vicinity are invited to meetings, which are held every Wednesday at 7:30 p. m. at the YMHA & WA on 179th St. and Ft. Washington Ave. (opposite the G. W. Bridge). Inquire at the desk.

COLUMBUS, OHIO, CHAPTER

John Van Rooyen, Waldo Hotel, Columbus, Ohio, is interested in organizing a SCIENCE FICTION LEAGUE CHAPTER for readers of THRILLING WONDER STORIES residing in his vicinity. Science fiction followers are urged to get in touch with Mr. Van Rooyen.

THE THIRD EASTERN SCIENCE FICTION CONVENTION

The third Eastern Science Fiction Convention, where authors and fans from far and near will gather to meet and exchange news and views pertaining to science fiction, will be held October 31, 1937 in Philadelphia. Those interested should get in touch with Milton A. Rothman, 2113 N. Franklin St., who is Chairman of the Convention.

NEW MEMBERS

UNITED STATES

Bernard Crowe, 1223 3rd Street, Portsmouth, Ohio; Cecil Gwinn, 261 Lombardy Hgts., Bridgeport, Ohio; Frank Peters, 222 Mawbey Street, Woodbridge, N. J.; Alvin Reed, 35 Ash Street, Ludlow, Kentucky; Jacob Rosen, 2768 N. Ringgold Street, Philadelphia, Pennsylvania; Ben Macias, 1307 N. Oregon, El Paso, Texas; W. P. Hays, 708 E. Boone, Frankfort, Indiana; Harry Sivia, 518 Tennessee Avenue, Palestine, Texas; Jay C. Compton, 15112 Greenleaf Street, Van Nuys, California; Billy Joe Grady, 204 Crosley Street, West Monroe, Louisiana; Francis Donahue, 339 Centre Street, Ashland, Pennsylvania; Jack Edgar, 621 Central, Cheyenne, Wyoming; Robert Moberly, 127 S. Cedar, Ottawa, Kansas; George H. Jones, Jr., 335 South 20th Street, Baton Rouge, Louisiana.

Edward Jacobsen, 4239 West End Avenue, Chicago, Illinois; Edison G. Engle, 10 Manor Avenue, Millersville, Pennsylvania; Chester Fein, 100 Ft. Washington Avenue, New York City; Anthony Nubile, 1818 East Second St., Brooklyn, N. Y.; F. J. Dudash, 7176 Wentworth Avenue, Cleveland, Ohio; Edward Wall, 426 Morrow Avenue, Carnegie, Pa.; William Warchol, 21 Gilbert Avenue, Haverhill, Mass.; Arthur Richardson, R. D. No. 1, Turtle Creek, Pa.; Otie Kip, 337 S. Cornuta Avenue, Bellflower, Calif.; Al J. Mazor, 589 William Street, Buffalo, N. Y.; Albert J. Birch, 8 South Ten Broeck Street, Scotia, New York; Walter Kissel, CCC Co. 3669, Ellsworth, Wis.; Cleo Griswold, 61 Park Street, Mansfield, Mass.

Jas. W. Hannett, U.S.S. Arizona, San Pedro, Calif.; James Douglas, 514 W. 3rd, Erie, Pa.; Jerry Shapiro, 1669 Grand Avenue, Bronx, New York; W. J. Hallman, 614 N. Second, Missoula, Montana; F. Bruen, 284 President Street, Brooklyn, N. Y.; Richard F. Smith, 42 4th Street, Huntington Sta., N. Y.; Arthur Kingston, Box 17, Farmingdale, N. J.; Jack Tarbell, 73 Whitney Avenue, New Haven, Conn.; Carl Erickson, 404 East Ash Street, Chisholm, Minn.; William Durka, 25 Greenwood Avenue, Waukegan, Ill.; Roy Clovers, 1003 N. Linon, Hobbs, N. M.; Merritt C. Wiest, Box 1269, Jamestown, N. Dak.; William T. Meyers, Jr., 644 Dauphin Street, Harrisburg, Pa.; Leo Molatore, 711 Edorado Street, Klamath Falls, Oregon; Bill Nelson, 2803 Grantwood Drive, Parma, Ohio; J. Molinaur, 880 E. 143rd St., Cleveland, Ohio.

Norman Spector, care of Camp Machanaim, Monticello, New York; Robert Donovan, Jr., 1219 Halpin Avenue, Cincinnati, Ohio; Frank Davis, Rt. No. 1, Box 625, Raleigh, Tenn.; Jack Mason, 99 Gloucester Street, Toronto, Ont.; Wm. T. Murray, 1629 Sparks Street, Philadelphia, Pa.; Eugene Deutsch, 177 Whittier Street, Bridgeport, Conn.; Hernando Garcia, 420 Brooks Street, San Diego, Cal.; Jerome Schwedt, 459 Emslie Street, Buffalo, N. Y.; Chester Hoey, 441 1st Street, Brooklyn, N. Y.; Chris. L. Mulrain, Jr., 66 Laurel Avenue, Irvington, N. J.; Charles Deibler, 103 S. Diamond Street, Mansfield, Ohio; Franklyn Brady, 142 S. Maple Drive, Beverly Hills, Cal.

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David Collen, 4929 York Blvd., Los Angeles, Calif.; Irving Faragher, 1675A So. 16th Street, Milwaukee, Wis.; Leo Sadoff, 844 So. 18th Street,

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Alex Chanin, 1451 Crotona Place, Bronx, N. Y.; Warren Gould, 902 E. 19th Street, Paterson, N. J.; Harold A. Wilcox, Jr., 2665 Decatur Avenue, Bronx, N. Y.; Bob Edwards, General Delivery, Ashland, Ohio; Harold R. Faltin, 6307 Hough Avenue, Cleveland, Ohio; John Larsen, Jr., 815 S. W. Vista, Portland, Ore.; Evelyn Howard, 325 N. Ontario Street, Burbank, Calif.; Clyde Kaufman, 218 Fisher Avenue, Tottenville, Staten Island, N. Y.; Edith N. O'Brien, 137 Gold Street, Buffalo, N. Y.; E. L. Kish, R. 3, Box 37, Barberton, Ohio; John H. Birkinbine, Yreka Spike Camp, Yreka, Calif.; Clarence S. Crandall, 520 E. 5th Street, Muncie, Ind.; D. M. Dietrich, 602 N. Negley Avenue, Pittsburgh, Pa.; Charles Schwartz, 11 Miami Court, Brooklyn, N. Y.; Norman Edwards, Port Henry, N. Y.

NEW MEMBERS

FOREIGN

Fred L. Common, Esq., 36 Primrose Street, Lancaster, Lancashire, England; Percival Augusttus Bones, Esq., Cotswold Ranch, 6 Forest Glade Leytonstone, London, England I., II.; W. J. Connelly, 5 Charing Cross Mansion, Glasgow, C. 3, Scotland; W. Baker, care of G. R. C. Taumaranui, New Zealand; Boy Griffin T., 2323944, "F" Company, Royal Signals, Catterick Camp, Yorkshire, England; Alfred Regden, 137 St. John's Grove, Southcoates Estate, Hull, Yorkshire, England; H. Grahame Paneley, Esq., 5515 Commercial Avenue, Vancouver, B. C.; Jacques Boniel, 97 Shepherd's Bush Rd., Hammersmith W. 6, London, England; S. Conning, 36 Telephone Road, Southsea, Hampshire, England; Walter Crafee, 17 Nichol Street, Haggerston, London, E. 2, England; W. William, 67 Percival Road, Feltham, Middlesex, England; M. Catlin, Esq., 59 Sidmouth Road, Leyton, E. 10, London, England; Henry Boernstein, 1071 Mt. Royal Blvd., Montreal, Canada.

ATTENTION, LEAGUE MEMBERS!

Coming—a Brand-New Prize Contest for Science Fiction Fans! Test Your Wits! Full Details and Rules in the next Issue of

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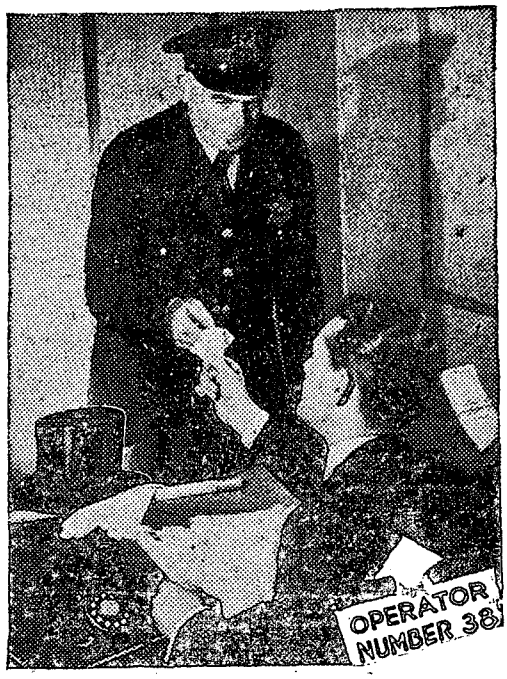
I'LL HAVE COMPLETE FACTS ON THE OTHER FELLOW TONIGHT!



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IN this department we shall publish your opinions every month. After all, this is YOUR magazine, and it is edited for YOU. If a story in THRILLING WONDER STORIES fails to click with you, it is up to you to let us know about it. We welcome your letters whether they are complimentary or critical—or contain good old-fashioned brickbats! Write regularly! As many of your letters as possible will be printed below. We cannot undertake to enter into private correspondence.

OCTOBER ISSUE TOPS

By John Chapman

The last two issues of T.W.S. have been the best since August of 1936. The return of the Penton-Blake series is the real reason for the change. In the August number, "The Double Minds" and "Conquest of Life" were the best of the stories. The Wesso cover is without a doubt the best you have had so far. More from Wesso, please.

The October issue is still better. Hamilton, Campbell, Giles and Zagat turned in good stories. Binder fell back again in "A Comet Passes." It was okay, but not up to his usual standard.

Why must there be one hackneyed story in every issue of T.W.S.? In August it was "The Iron World," and now it's "The Hothouse Planet." I can imagine female Frank Bucks chasing giant reptiles through the Venusian swamps. Plausible science fiction, isn't it? The surprise of the whole October issue came when the signs of a grand clinch at the finish began to fade. But leave it to Arthur Barnes—it came.

I'm all for J. J. Demaree's idea to have photos and write-ups of authors published. Something like that would nicely take up the space occupied by ZARNAK. You know, this fellow Max Plaisted could really make a name for himself in the science fiction world. He could write a story that no author had ever thought of before; he could have one of those super what-do-you-call-it animals or something pounce on our mighty ZARNAK and chew him to pieces. That would be a story in which the hero died before he conquered his enemies. At least, T.W.S. readers would see the long-awaited "The End" tacked to our favorite comic strip.—1521 Como Avenue, S.E., Minneapolis, Minn.

(Photos of T.W.S. contributors will appear from time to time. Mr. Willy Ley is represented in this issue. Mr. Plaisted does not like your plot.—Ed.)

STORIES CAN'T BE BEAT!

By Donald Thielke

There is a saying that runs roughly like this: "Some books are to be lightly tasted; others, chewed; but some are to be tasted, chewed, and digested." Your publication is, beyond a doubt, the latter type, for your illustrators are inspired, and your stories—well, they just can't be beat. However, sometimes even the best make mistakes, and Haggard's story, "Round About Rigel," is nothing but a mistake.

In the August issue "Conquest of Life," by Binder, ranked top-notch in my estimation. Following along in close succession were "The Solar Menace," "Space Mirror," "The Double Minds," "The Iron World," "Vision of the Hydra," and "Rift in Infinity."

What's chances for T.W.S. becoming a monthly?—2735 N. 45th St., Milwaukee, Wisconsin.

ANALYSIS

By Donald Allgeier

I have just completed the October T.W.S. and have compared it with the current issues of the other science fiction magazines. I find that the comparison is favorable to your periodical. I believe the testing period for the new T.W.S. is over. It is time for the magazine to become a monthly. Only thus can you print serials—the real cream of science fiction are the great novels of the masters in the field.

The effect of Stanley G. Weinbaum's writing on interplanetary stories in general seems unbelievably far-reaching to me. Before, the interplanetary story was usually a tale of war and conquest or of the exchange of scientific ideas between two advanced races. Now, the bulk of the stories deal with man's reactions to queer and unusual forms of organic life. This, I believe, was Weinbaum's greatest contribution to science fiction.

At present there are many writers who, though not conscious imitators of Weinbaum, are unquestionably influenced by him. The writer who creates the most interesting and fantastic form of semi-intelligent plant or animal life is the most successful writer. I am heartily in accord with this new trend. I have to chuckle over the antics of queerly human denizens of other worlds.

The two best stories in your October number are excellent examples of this new type of story. I refer to "The Hothouse Planet" and "The Immortality Seekers."

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The "murri" and "Pipeline" are among the most interesting of creatures. Barnes contributes, here, his best story—a really arresting and fresh sort of yarn. How about continuing his depiction of the adventures of Gerry Carlyle—with Tommy Strike included, of course.

Campbell's new series is splendid. It depends, for its interesting quality, on the facile imagination which can conceive of "Pipeline," "shleath" and "thushol" (though Smith's "Planet Entity" in an old quarterly first presented that idea).

Henry Kuttner's initial offering in your pages is certainly new and different. He had a splendid idea and he did well with it—though I believe a novelette or a novel might have been written around it. I didn't like the way Binder's novelette just stopped—it didn't end. This story was inferior to "Conquest of Life," a magnificent yarn.

I've never encountered "Tubby" before, and hence "The Space-Time-Size Machine" left me a little bewildered. I hardly knew how to take it. Zagat's novelette was boresomely trite. It begins to look as though his "Lanson Screen" was merely a flash in the pan. "Holmes' Folly" was good. Giles' new story didn't equal his interesting "Vision of the Hydra," though it had a good style.

So much for the stories. The art work is good, too. I'm glad to see more pictures by my favorite artist, H. W. Wesso. However, don't quit using Marchioni. He is a fine artist too. Who draws your covers when Wesso doesn't? (Brown—Ed.)

I'm very much in favor of an author's department—especially with pictures of the writers. Your magazine has a most interesting array of departments and features. Don't lose them—particularly "Story Behind the Story," and "If." The LEAGUE seems to be doing its bit by contributing ideas to authors.

I'd like to see stories by Laurence Manning, Keller, Flagg and Pragnell.—643 S. Robberson, Springfield, Mo.

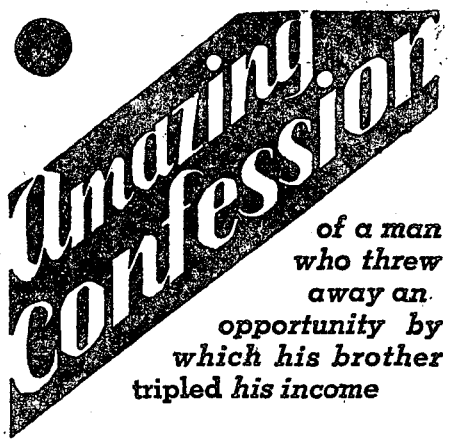
HAVING WONDER-FUL TIME

By Robert W. Lowndes

Despite your truly prodigious efforts to the contrary, laws of probability being against you, there have been a few fugitive items, here and there during your first year, that were almost worth the trouble of reading twice. This, I realize, is not your fault: you are only human; you must make mistakes. And, being a little more nearly intelligent than many, you like to be told about your slips so that defects may be remedied, if possible. Well and good; then you will certainly not object to these notes, written as they are in the most cordial of sympathy with your endeavors, and in the most sincere of desires to help dear old THRILLING WONDER STORIES continue burrowing merrily along in the sands of banality.

1. Perhaps the most outstanding slip was

(Continued on page 120)



"I WANT you to know why I am starting to study accounting under your training. I am a married man, with two children, and a wife in poor health. For seven years I have held my job as a shipping clerk for a bakery—without a raise the past six years.

"My brother started to work at about the same time I did, and took your training in Higher Accountancy. He has never been out of work, and has progressed steadily until he is now Chief Accountant and Office Manager for an automobile company here, and is making three times as much as I am.

"I know I was a sucker for not starting when he did. But I was skeptical, and the training cost, even though small, looked like a lot of money with all my doctor bills. I know now that the most expensive thing I did was to put off this training, because I can see what it did for my brother."—E. B.

* * * *

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(Continued from page 119)

"Rhythm of the Spheres"; this being poetic prose of the highest caliber, and quite worthy of A. Merritt at his best. This, and the little bit of satire contained in Farley's "Liquid Life," gave your second issue a tang of that delightful, thought-provoking zest, which you want to avoid. Never let it be said that T.W.S. is a magazine to inspire its readers to think—except perhaps along certain parrotlike trails which have been propounded for centuries into axioms for the masses. Then, again, "Brain Stealers of Mars" showed a sense of humor, another bad trait for you; mediocrity must be dignified at all times.

2. Stories like "The Lanson Screen," being well written, are distinctly out of place. Have your authors study Ray Cummings, Edmond Hamilton, or almost any of your regular contributors, so that they can get into the spirit of things before they start to work. I'll confess, I was almost afraid that Eando Binder would be too much for you, as his work is usually of quite a high quality, but most of his stuff you've printed has been down to his standards. And Anthony Rud, I fear, is quite hopeless; despite the astronomical errors, which tended to make his "Molten Bullet" absurd, it was still an excellent piece of work. Arthur K. Barnes, I trust, will do better by you in his forthcoming novelette.

3. ZARNAK, I must say, is splendid; not only is it very sloppily drawn, but the author has borrowed from at least a half dozen writers of science fiction, as well as L. Frank Baum (a writer of fairy tales; my little brother is devouring him now; it will make, I think, an excellent background for T.W.S.) and Gypsy Rose Lee.

4. I'm not sure that adding Wesso was such a good move; he is an artist, you know. But then his quality work is balanced by the cheaper paper and your continued juvenile layout. And then, I can understand the advantage of using him; he is very popular and perhaps a number of true s-f fans will start buying your magazine for his work.

Until the next issue, then, here's three lusty cheers for T.W.S., its editors, authors, artists, and such; you are the quintessence of the subnormal; may your tribe increase (It will, anyway.)—Greenwich Hospital Ass'n., Greenwich, Conn.

(Readers will note Mr. Lowndes' address and will send him, airmail, one trinite explosive capsule. Those residing in the near vicinity use atom-blasters.—Ed.)

WANTS "ETHERLINE" SERIES

By Adolph Davidson

The new October issue of T.W.S. is a great improvement over the previous ones. It is the best number so far, in my estimation. "Via Etherline," by Gordon A. Giles, was my favorite story. It demands a sequel. In fact, it could easily be made into a series, in the Penton-Blake number. Arthur K. Barnes' "Hothouse Planet" was also good and calls for a series. It is very reminiscent of the early Weinbaum stories.

"A Comet Passes" was good, but the plot was slight. I have only one thing to say about Cummings' "The Space-Time-Size Machine"; can't Cummings write about any other subjects than inter-atomic (or time) travel? Keep up the good progress—1 Post Street, Yonkers, New York.

(We hope your letter induces Mr. Giles to write a sequel to "Via Etherline." The same goes for Arthur K. Barnes.—Ed.)

FOR LOVECRAFT FOLLOWERS

By K. Russell Miller

Many readers of THRILLING WONDER STORIES mourn the deaths of Stanley G. Weinbaum, David R. Daniels, H. P. Lovecraft and Robert E. Howard, all masters of fantastic literature.

In view of this fact it is with great pleasure that we, The Classic Printers, announce that we have been fortunate in securing little known tales by each of these writers as well as those by other T.W.S. contributors—Eando Binder, Arthur J. Burks and Ralph Milne Farley. They will all be printed in our series of pamphlets, to be known as "The Bizarre Series."

The first of the series—"Beyond the Wall of Sleep," a short science fiction tale by H. P. Lovecraft, will be ready for circulation on or before October 1st. There will only be a limited edition. Readers interested in obtaining a copy should drop me a post-card at the address below.—Millheim, Penna.

ONE FOR "SPACEWARD"

By Jack Speer

Of the entire August issue, I enjoyed the article, "Spaceward," best. The information has doubtless been published before in both magazines and books, but I haven't read it. I would like to say, in passing, that I disliked the reference to the Almeria reprisals in the Spanish Civil War. For various reasons my opinions are different, and I resented Mr. Cleator's slap at the insurgents. When it is not essential to the substance of an article or story, our authors should not take sides on current controversies.

But the final page of "Spaceward" deserves to rank with the classics. I wish it were possible to publish it throughout the length and breadth of the land, and decree that everyone read it. It is a bitter and sarcastic indictment of mankind in general, cleverly presented, and incidentally was the most outstanding thing you have published in a long while.—117 North Fourth Street, Comanche, Oklahoma.

(Mr. Speer, in our opinion, is much too touchy and suspicious as far as the Spanish situation is concerned. Mr. Cleator's reference was not only perfectly relevant in its bitterly ironic commentary on government armament expenditures, but was so indirect as to be hardly interpreted in any other than a general sense.—Ed.)

COVERING THE COVER

By John V. Baltadonis

The cover by Brown is very good and very effective. However, there are little

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things about it that do not coincide exactly with the story. The ship, "The Ark," wasn't anywhere near the group of intrepid explorers at the time the "whip" charged them in the story. Yet, there on cover is the vessel—quite conveniently. And the ship doesn't at all come up to the author's description of it. It is entirely too small on the cover—remember: "Gerry Carlyle's famous expeditionary ship was an incredible monster of gleaming metal, occupying almost the entire field, towering into the air further than the eye could reach in that atmosphere." However, despite those mistakes, the cover was a very good one.

Campbell rings the bell again in this issue! His "Immortality Seekers" is the best yarn in the number. Barnes' Venus tale is also very good. It looks to me as if we'll have a series of events occurring on the planet of veiled mystery—Venus. At least, I hope so. Henry Kuttner's debut in T.W.S. is a most successful one. I've always followed this author's weird fiction in other publications with avid interest. I hope that Kuttner submits more stories in the future. I was pleased to read another story by Gordona A. Giles. I like his "Vision of the Hydra" very much in the last issue and I also liked his "Via Etherline."

The illustrations in the issue are all very well done. However, I wish Marchioni would pay a bit more attention to his anatomy—the arms of Penton and Blake are monstrous—look more like the arms of apes.

I would like to see the department suggested by J. J. Demaree.—1700 Frankford Ave., Philadelphia, Penn.

HE TRIED IT ON HIS PIANO!

By Wilbur J. Wilmer

In your October issue of THRILLING WONDER STORIES, in the department, SCIENTIFACTS, it was stated that the greatest three-digit number possible was 9^{9^9}. It is. However, it was also said that the time required to complete the operations indicated was about twenty-eight years, providing one did one digit per second.

I have finished the work in approximately four hours, and the paper required to state the answer is extremely much smaller than the amount your magazine said would be needed (equal to the distance between New York and Chicago, I think it was).

The number is: 19,618,882,737,713,570,781,787,405,230,277,976,087,323,558,207,884,433,331,662,445,795,751,483,812,709.

I worked it out on the following principle:

$X \times X \times X = X^3$

$X^3 \times X^3 \times X^3 = X^9$

$X^9 \times X^9 \times X^9 = (X^9)^3$

$X^{9^3} \times X^{9^3} \times X^{9^3} = X^{9^9}$.

I have also figured out the number in words and get the following result:

Nineteen thousand six hundred eighteen dectillion, eight hundred eighty-two notillion, seven hundred thirty-seven octillion,

(Continued on page 122)

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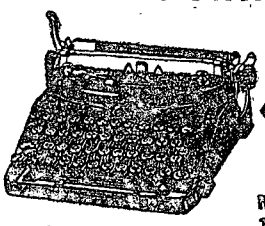

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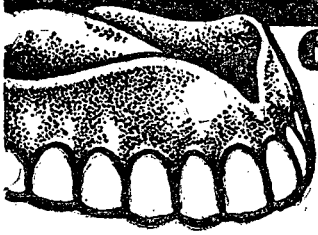

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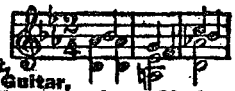
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(Continued from page 121)

seven hundred thirteen septillion, five hundred seventy sextillion, seven hundred eighty-one quintillion, seven hundred eighty-seven quadrillion, four hundred five trillion, two hundred thirty billion, two hundred seventy-seven million, nine hundred seventy-six thousand, eighty-seven duodecillion, three hundred twenty-three thousand five hundred eighty-eight dectillion, two hundred seven notillion, eight hundred eighty-four octillion, four hundred thirty-three septillion, three hundred thirty-one sextillion, six hundred sixty-two quintillion, four hundred forty-five quadrillion, seven hundred ninety-five trillion, seven hundred fifty-one billion, four hundred eighty-three billion, eight hundred twelve thousand, seven hundred nine.

Although there may be some numerical errors in multiplication, I believe the above figures to be very nearly correct.—679 Park Avenue, West New York, New Jersey.

(Unfortunately for Mr. Widmer's rebuttal, but fortunately for his family, he mixed up his mathematical rules halfway through his calculations.

$X^3 \times X^3 \times X^3 = X^9$—that is true. The rule for such operations is to add the exponents—in other words, $X^3 \times X^3 \times X^3 = X^{3+3+3} = X^9$. And $X^9 \times X^9 \times X^9 = X^{9+9+9} = X^{27}$ or $(X^9)^3$ — but not X^{9^3}. Watch those parentheses! For $9^3 = 9 \times 9 \times 9 = 729$ so that $X^{9^3} = X^{729}$ not X^{27}, as Mr. Widmer's calculations indicate. Moreover, the last step is entirely inaccurate not only as a logical sequence but mathematically. For $X^9 \times X^9 \times X^9$ would equal $X^{729+729+729}$ which is not, as a brief comparison would show, X^{9^3}.

The farther you go, the worse it gets, as can readily be seen. If Mr. Widmer will promise us social security (and a little gravy) for the next 28 years 48 days—plus—we will report back with a certified check on M. Luisant's statement.—Ed.)

READER REACTIONS

By C. Battell Loomis

You are getting out a carefully edited magazine, and I know you are interested in reader reactions, so I address you to tell you what I like and don't like. I don't like interplanetary war stories, because I believe they prejudice youth in favor of continuing the silly old scheme of things by which good men are destroyed, when bad ones ought to be, exclusively. "Bad" is not a moral term, but a physical one, with me; a metabolically unbalanced person is a physical fluke and as worthless as a rotten apple from which the good seed has been extracted.

I like Mr. Cleater's "Spaceward" article so much that it is the direct occasion for my taking my typer on my knees. I would have written him, save for his distance in space. It occurred to me that the obvious governor of a rocket in space must be sunlight, and sunlight also its fuel. I have written a story on this theme (Don't fear, I'll not submit it!) The gist of the idea is that Newton's third law applies as well to a focussed light-beam as to any other form of radiation, and of course any fuel in the act of explosion is radiating.

I think it barely possible that the search for atomic power is one of those famous (or to be famous) *ignis fatui* which have often

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beset science—like the question how many angels can stand on the point of a needle? It is also possible that radium does not radiate anything but atoms from molecules that have suffered such severe compression deep in the earth, where pressures approach 400 million pounds per square inch, that their mere expansion at sea level is explosively powerful and frictively destructive of its environment of more loosely combined substances. This concept I do not base on the notion that the earth's core is a mixture of nickel and steel. Their weight is the symbol of the pressures to which they have been submitted by gravity. That we find them, or even so relatively light a substance as gold, at all upon Earth's surface are due to leaks incurred by oscillations that have disequalized Earth's pressure and let spurts of the inward solidified fire out.

I say "solidified fire" because at Earth's core fire could not be expanded. Under such a push from all sides it would form a parallel for that stress fluid of which McCann has elsewhere written—a state of solid stone in which it flows like mud. It would be frictive heat without oxygenic flame.

To return to the rocket ship. For its powering during its flight through the atmosphere, why could it not use plain water? Why could it not tank a supply for use after it had risen the first 6 or 8 miles and take its water by forced draught from the air, while passing the cloudy belt? With a series of large sun-reflectors focussed on its "hot-spot" it could convert this water into steam and jet it forth until the atmospheric supply ceased, whereupon it could use its fuel-tanks. At a certain height it would enter the zone upon which the aurora borealis is said to play—a zone of nearly pure nitrogen. Its atmospheric "breathers" would here again come into use, to take in nitrogen for use as fuel until the hydrogen layer was reached, which would then supply the last fuel needed to clear Earth's atmosphere. Having cleared it, it would practically have cleared Earth's gravital power upon it, wouldn't it? It could now begin to use indirect sunlight and travel backward from its own powerful Earthward-flung beam of concentrated light.

This would be a most useful flying fish indeed, for its converters would be equipped to extract any type of fuel liable to be found in any planetary atmosphere—and its spectroscope would at once begin a pristine study of planetary lights, unhindered by Earth's atmospheric refractions. Thus it could ascertain before it had gone too far, whether it would have a chance of returning after entering an alien atmosphere.

This sort of departure from Earth would involve no excessive speeds nor material and human strains—the heat of the reflector beams would, of course, depend upon clear weather but plenty of deserts provide this and plenty of mountain ranges near deserts supply enough moisture for the fuel needs.

Having reached space, however, speed

(Continued on page 124)

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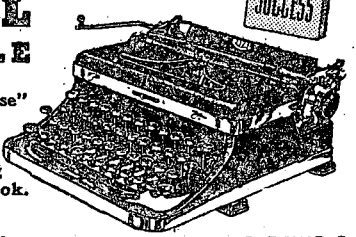

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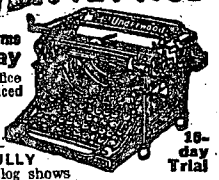

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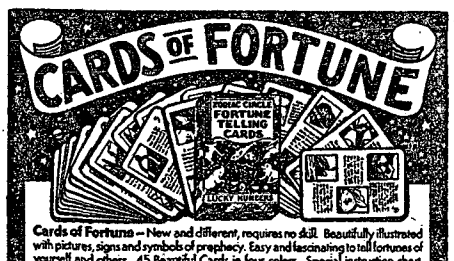

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(Continued from page 123)

would become material as against time and immaterial as concerned the travelers, who, being in their own self-contained world, should not feel the steady acceleration that might reach to a speed little short of the speed of light; they would have no friction to deal with and their sole danger would be of collision with meteors, but even this could be guarded against by means of telefoto appliances in hitch with automatic steering devices — dodgers. — Manhattan Beach, California.

(Radium does not radiate atoms: it does radiate (a) "gamma" rays—ultra shortwave light; (b) "beta" rays—free electrons; (c) "alpha" rays—the nuclei of helium atoms. Every now and then it does give off a whole atom of radon, a radioactive gas. Also, your theory does not account for radium's being a distinct chemical element having radioactivity as one of its incidental properties. If your idea is there, why isn't all lava spewed up out of the bowels of the earth radioactive?

You're quite right that the heavy elements are concentrated at the earth's core—only with iron predominating as it does there are several million cubic miles more of it down there than of anything else. Maybe the middle is pure neutronium—who knows?

If you're using atomic energy, you can easily carry enough fuel of any kind to take you where you want to go, without resorting to all sorts of complicated apparatus to suck in water vapor, hydrogen and the aurora borealis. If not, we can't see you getting off the earth at all with nitrogen or water alone—but the reasons why are a long and technical story. Certainly light would push you—all you have to do is make it strong enough. Or is that what you mean?

Speeds and accelerations in leaving Earth or any planet depend entirely on how much fuel you can carry; if you have enough, you could take off at a walk. Look up your physics book if you want to be convinced. The same physics will tell you that anyone can feel any acceleration—not speed, but change in speed.—Ed.)

OTHER GOOD LETTERS RECEIVED FROM—

VIDA CLAIRE SCHNEIDER, 25 Putnam Ave., Porchester, N. Y., who thinks SCIENTIFACTS and ZARNAK are our two best features, and who is a stamp collector. She would like to correspond with fellow science fiction followers.

EUGENE DEUTSCH, 177 Whittier St., Bridgeport, Conn., who claims T.W.S. is the best science fiction magazine on the market, and would like to see the magazine issued monthly. Mr. Deutsch's hobbies are chemistry, microscopy and tropical fish raising.

HERMAN LEVENTMAN, 1021 Belmont Ave., Brooklyn, N. Y., who states T.W.S. is a 100% improvement over the old one and would like to correspond with readers interested in astronomy.

EUGENE M. SMITH, 1035 Kiernan Ave., Spokane, Washington, who requests a sequel to Eando Binder's "Conquest of Life." . . . Also, he is in favor of the Penton-Blake series. (There will be a sequel to "Conquest of Life" in the next issue.—Ed.)

J. B. BENTON, Decorah, Iowa, who writes to let us know that he and his friends rated "Via Etherline," by Gordon A. Giles, the best yarn in our last issue.

TED SIMPSON, 123 Carter Lake Club, Omaha, Nebraska, who casts another vote for Binder and Campbell, Jr., and who would like to see "IF" expanded to three pages.

LEO MOLATORE, 1110 Main Street, Klamath Falls, Oregon, who informs us that the August issue of T.W.S. was the first he ever read—but won't be the last. "Iron World" and "Conquest of Life" were his favorites.

H. MILLERON, 11723 Ventura Blvd., North Hollywood, Calif., who writes us interestingly about some technical fallacies in Paul Ernst's recent story, "Rift in Infinity," and who rates "Conquest of Life," "The Iron World," and "The Double Minds" the three toppers of the August number.

JAMES V. TAURASI, 137-07 32 Avenue, Flushing, New York, who drops us a brief note indicating

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his approval of P. E. Cleator's scientific article, "Spaceward," and who requests more of the same type. (We have a long list of science articles by world-famous scientists prepared for future publication. The article by Sir James Jeans, in our next issue, is the first of this series.—Ed.)

JACK MASON, 99 Gloucester St., Toronto, Ont., who would like to see more stories of interstellar exploration. "I like the Neil R. Jones Professor Jameson series," he writes. "His interplanetary stories are consistently interesting."

AMOS OTIS, 3212 Osgood, Chicago, who would like to get in touch with neighboring science fiction fans, and who ranks T.W.S. tops in its field.

PAUL H. SPENCER, 88 Ardmore Road, West Hartford, Conn., who insists that it will be years before the spectacular scientifilm, "Things to Come," can be supplanted by another picture equally as good.

W. GARBER WIGGINBOTHAM, Box 23, Bethesda, Ohio, who wants more science in his stories, also some science fiction correspondents.

GLENN WHALEY, Marshall, Illinois, who has a criticism to offer anent the covers. "Have your artist tone them down," he states. "A cover in softer shades makes a better impression on the buyer. Also, they are far less spectacular."

ALFRED BROWN, 407 Queen St. West, Toronto, Canada, who suggests the incorporation of a department for science discussions, and who presents two interesting problems of his own. (What's the vote, readers? Want such a department, or are the other departments sufficient?)

WILLIAM DUNKA, 25 Greenwood Avenue, Waukegan, Illinois, who tells us he is interested in astronautics, rockets and space travel, and would like fellow readers to tell him where he can learn more about this subject.

THE STORY BEHIND THE STORY

EXACTLY one year ago THRILLING WONDER STORIES presented to its readers JOHN W. CAMPBELL, JR.'S first Penton and Blake story, "The Brain-Stealers of Mars." Since that time Penton and Blake have established themselves definitely as science fiction's most popular adventure team. Their experiences with the strange life-forms of other worlds—the *thushol* of Mars; the *shleath* of Ganymede; Pipeline of Callisto—have been recounted with the same sophisticated appeal characteristic of the late Stanley G. Weinbaum's work.

In this month's issue, JOHN CAMPBELL again spins a Penton and Blake novelette. This time the lads meet up with the super-evolved inhabitants of a planet more distant than Pluto, a land where everything is frozen—even oxygen. And now let the author break the ice and tell you what his new yarn, THE TENTH WORLD, is all about:

LIFE AT ABSOLUTE ZERO

THE TENTH WORLD originated basically in an attempt to picture a form of life sufficiently resistant to live on a world at near absolute zero temperatures. I have not, in the story, suggested how life might have

(Continued on page 126)

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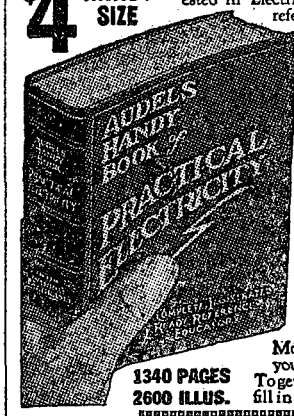

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Mr. S. W. Harrison, 446 N. Main St., Brewer, Maine, writes: I have received wonderful relief by means of the Prosager. It certainly has made a new man out of me. Mr. J. W. Geary, 18 Poinsettia Ave., Sebring, Fla., states in his letter: Received the Prosager May 20th, my prayers have been answered. I have used it six times and am a different man. Mr. A. P. Hoffman, 8104 Euclid Ave., Cleveland, O., writes: The Prosager is helping very much and would not be without it. Mr. S. V. Kindig, Box 213, Fairplay, Colorado, states: I feel 20 years younger and I would not take anything for the Prosager if I could not get another.

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MEN PAST 40

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(Continued from page 125)

originated under such circumstances, since it is evident that only highly organized forms could exist. But this might be accounted for by assuming an original radio activity of the planet which had once maintained the temperature sufficiently to permit life to start, with a subsequent gradual cooling that drove the now highly-organized forms to build defenses against encroaching cold.

The one-way heat transfer that I propose as their actual defense against freezing, I believe to be not wholly impossible. Particles the size of individual life cells can, and do in the Brownian Movement, actually move as giant molecules in the heat-dance of matter. The most characteristic thing about life is the ability to select; thus selecting direction of heat transfer is quite plausible.

For instance, there is no known way to separate the two optically active isomers of a chemical compound (such as dextro and levo rotary glucose) that does not involve, directly or indirectly, the mysterious selective powers of life. You can pick out the crystals by hand, using your own life, or react the compound with other active substances, or ferment the one and not the other, but in every case, life does the selecting. No physical or chemical process will.

No physical or chemical process permits of one-way heat transfer—but perhaps life can. Clerk Maxwell's famous "demon" was in effect, a suggestion that a life-thing could select, and direct heat-flow.

That hydrogen and oxygen, both perfectly dried, will not unite is a little known, but well established fact. Complete dehydration frequently produces amazing effects; what, in the end, may come of the study of total dehydration is not known. But one man ever studied that problem seriously, because of the time required. This scientist dehydrated benzene (by using phosphorous pentoxide, a substance with an immense affinity for water, as drying agent) for eight years.

The result was that the benzene no longer answered the customary tests, its boiling and freezing points were wholly different. Many reactions would not take place in the total absence of water. Hydrogen and oxygen, hydrogen and chlorine, a number of other reactions normally terrifically violent, explosive in nature, did not progress at all.

THE TENTH WORLD is built up on the amplification of these speculations.

THE LAWS OF SPACE-TIME

FORMULA number 11, d, seems to be the good old standby of many science fiction writers when they try to get their space ships off into the ether. In other words, few writers take the time out to create a *new* method of realizing the terrific rate of acceleration necessary to propel a vehicle out of the earth's gravitational influence. A MONTH A MINUTE, by RALPH MILNE FARLEY, introduces an ingenious variation of this conception. Here's what he has to say about his idea and its application in his novelette:

As my readers may or may not know, I am (on the side) a Reserve Major assigned in event of war to the Technical Staff of the U. S. Army, and a Lecturer in Mathematical Physics at the Graduate School of Marquette University.

While doing some work on dimensional analysis one day, a reference to the rather rarely encountered physical conception of "sectional density" (M/L^2) suggested the idea of inventing some new physical quantities with arbitrarily assigned dimensions, and then trying to conceive what such quantities would be like.

The simplest way to do this would be to interchange M and L, or T and L, for example,

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in the dimensional expression for certain well-known physical concepts; and this led to the thought: "What would happen if such an interchange were suddenly to take place in real life?"

The Relativity idea that time and distance are somewhat analogous, immediately suggested to me that such an interchange of T and L might actually be possible. If so, then I had solved the difficulty which has rendered so many science fiction stories ludicrous, namely the unbearable accelerations necessary to attain the asserted speeds of their spaceships.

A MONTH A MINUTE was the natural outgrowth of building a human interest plot on this basic idea.

I might add that I borrowed a terrestrial globe, built a small model of the spaceship, and employed an electric flashlight (won in a Bingo game) as the sun, in order to check upon the relative motions and positions recounted in my story.

MYSTERIES OF THE STRATOSPHERE

THE MIND MAGNET, by PAUL ERNST, is an exciting science fiction novelette of the stratosphere. Ernst's story packs a surprise ending, so this is fair warning to read the yarn before reading this letter, for the surprise ending of the tale is discussed here. Paul Ernst, as many of you probably know, is a very prolific writer, and does work regularly for our many other magazines—detective, mystery and adventure. But science fiction is his pet subject, and you'll always find Paul ready to talk about it. Here goes:

Along with a lot of other people, I have always been interested in the possibility of life on ALL the solid substances of space. There is life on at least one planet: ours. Why mightn't there be life on all the planets? And, following that, on all the asteroids large and small that wander in space—and even on the dustlike specks so thinly scattered through infinity? Each could conceivably have a minute film of oxygen to support life, or perhaps some other gas that would supply creatures with the vitality which oxygen gives to us.

There is a complete world in a drop of water. Why not a complete and variegated world on a fleck of dust floating in from some remote part? From the query grew the story, THE MIND MAGNET. Locale was developed as the plot grew: Our tiny world would be least disturbed before it had hit Earth's heaviest atmosphere. Therefore we should encounter it in the stratosphere or higher. Professor Piccard's well-known experiments with stratosphere balloons came to mind at once, and thus the story was set.

I hope the story delivered, in the reading, some small part of the pleasure I got out of writing it. There is a peculiar fascination to writing pseudo-science fiction. It is an intriguing mixture of science facts, and speculations which these facts often lead to. The speculations rest, however, largely on logic and common sense—and it is unnecessary to list how many times logic has been born in pseudo-scientific speculation, and has come to rest years later in a solid scientific accomplishment achieved from experiments worked out along identical lines.

First, sheer imaginings as to how it might evolve; next, laboratory delvings on all angles of the new discovery; finally, often enough, a result so close to the original imagining that it makes the fiction seem eerily akin to fact. So you may be reading tomorrow's sober laboratory announcements in these pages. Hold your hats!

(Concluded on page 128)

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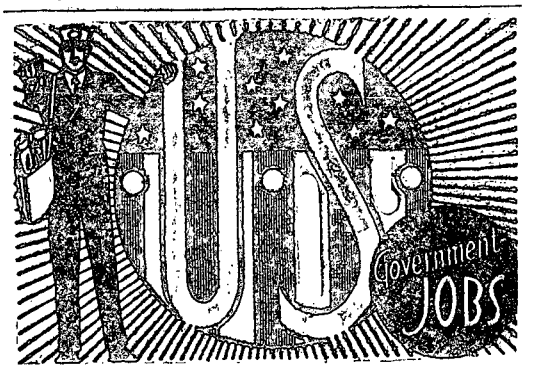

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(Concluded from page 127)

THE EXPANDING UNIVERSE

IT isn't only grey matter that science fiction writers use as a stimulus for their fiction. In EDMOND HAMILTON'S case here, it was a serious statement by a brilliant physicist that inspired his latest story, WHEN SPACE BURST. Hamilton's explanation is an interesting one:

The story, WHEN SPACE BURST, had its genesis in a chance phrase in a scientific work. I had been reading Eddington's brilliant and fascinating book, THE EXPANDING UNIVERSE. Somewhere in it, he refers to the expansion of the spherical space of our cosmos as being almost exactly similar to the blowing up of a soap bubble.

That simile started me wondering. If you blow up a soap bubble for so long, it gets so big that the tenuous film can no longer hold together, and the bubble bursts. What about the expanding space-bubble of our Universe? Would that ever get so big that it would burst, too? If it did, just what would happen?

It seemed to me that if our space-bubble ever did burst, the result would be the splitting of space into isolated fragments, separated from each other by an extra-spatial gulf. And it also seemed perfectly logical, in view of Einstein's theorems, that each such fragment would close up around the matter inside it, and would form a miniature spherical cosmos, its diameter depending upon the amount of matter it contained.

A great number of little spatial universes, each forever separated from the others by dimensional abysses—that would be the result, I thought. And what if an interstellar ship happened to be marooned in one of them, cut off forever from the little cosmos that held the Solar System? That suddenly began to look like a story—and here it is!

LABORATORY SCIENCE

BEYOND THAT CURTAIN, by ROBERT MOORE WILLIAMS, marks the first appearance of Mr. Williams in THRILLING WONDER STORIES. His yarn is a good one, and we're certain you'll like it as well as those by the regulars. You should—Williams got his inspiration from the science fiction writer's Bible—the writings of Sir James Jeans.

BEYOND THAT CURTAIN is rooted in a statement by Sir James Jeans: "Just as the shadows on a wall form the projection of a three-dimensional reality into two dimensions, so the phenomena of the space-time continuum may be four-dimensional projections of realities which occupy more than four dimensions." A whole world of speculative thought is opened by that statement. Beyond, beyond, beyond—the Something that is a little farther on, the intangible, inexpressed quantity that always lies beyond the veil. It is, in my opinion, the place of science fiction always to treat of this mystic quantity, to explore where the equations of the mathematicians have not yet charted a trail, where the scientists have not yet paved that trail with hard, experimental fact.

Science today is inclined to interpret nature in terms of mathematical pictures, pictures which are fictions, but which alone seem capable of according with observational fact, discarding the mechanical interpretation prevalent during the last century. Perhaps, fifty years from now they will have discovered that they were wrong, and will be seeking another interpretation. Meanwhile the experimenters, from university halls to obscure laboratories, will continue seeking facts to strengthen or destroy that theory.

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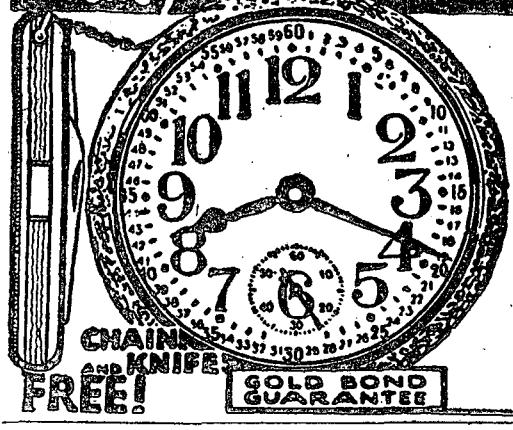

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THE BLOODLESS PERIL

(Concluded from page 109)

Storm took his arm from around Laura's waist. His eyes sought hers, levelly, inquiringly.

"Well?" he said, gently.

Laura managed a smile, though it shivered a little on her pale and tremulous lips.

"We might be able to use those horrible things in war against the Orient," Storm said. "We could drop seeds of these man-eating things in their most ferocious stage of evolution. They'd grow to their full size in about five weeks, and we could rain down tubes of my palsy virus to keep soldiers from hacking them down before they'd overrun the enemy sectors. We'd have victory in a month and a half, if you'd consent to work with me."

Laura moved back into the circle of his arm.

"Yes, Ryder. With you. Beside you. The High Command may have my evolutionary product, for no human beings could be worse than those flowers!" She sighed. "I guess we'll have to take the world as we find it in the present, and fight to preserve what we think is best in it."

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Make up your mind today that you're going to train yourself to do some one thing well. Choose the work you like best in the list below, mark an X beside it, and, without cost or obligation, at least get the full story of what the I. C. S. can do for you.

INTERNATIONAL CORRESPONDENCE SCHOOLS

BOX 3970-K, SCRANTON, PENNA.

★ Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," and full particulars about the subject *before* which I have marked X: ★

TECHNICAL AND INDUSTRIAL COURSES

- ☐ Architect
- ☐ Architectural Draftsman
- ☐ Building Estimating
- ☐ Contractor and Builder
- ☐ Structural Draftsman
- ☐ Structural Engineer
- ☐ Management of Inventions
- ☐ Electrical Engineer
- ☐ Electric Lighting
- ☐ Welding, Electric and Gas
- ☐ Reading Shop Blueprints
- ☐ Heat Treatment of Metals
- ☐ Sheet Metal Worker
- ☐ Boilermaker
- ☐ Telegraph Engineer
- ☐ Telephone Work ☐ Radio
- ☐ Mechanical Engineering
- ☐ Mechanical Draftsman
- ☐ Machinist ☐ Toolmaker
- ☐ Patternmaker
- ☐ Diesel Engines
- ☐ Aviation Engines
- ☐ Automobile Mechanic
- ☐ Refrigeration
- ☐ Plumbing ☐ Steam Fitting
- ☐ Heating ☐ Ventilation
- ☐ Air Conditioning
- ☐ Steam Engineer
- ☐ Steam Electric Engineer
- ☐ Marine Engineer
- ☐ R. R. Locomotives
- ☐ R. R. Section Foreman
- ☐ Air Brakes ☐ R. R. Signalmen
- ☐ Highway Engineering
- ☐ Civil Engineering
- ☐ Surveying and Mapping
- ☐ Bridge Engineer
- ☐ Bridge and Building Foreman
- ☐ Chemistry
- ☐ Pharmacy
- ☐ Coal Mining
- ☐ Mine Foreman ☐ Fire Bosses
- ☐ Navigation
- ☐ Cotton Manufacturing
- ☐ Woolen Manufacturing
- ☐ Agriculture
- ☐ Fruit Growing
- ☐ Poultry Farming

BUSINESS TRAINING COURSES

- ☐ Business Management
- ☐ Industrial Management
- ☐ Traffic Management
- ☐ Accountancy
- ☐ Cost Accountant
- ☐ C. P. Accountant
- ☐ Bookkeeping
- ☐ Secretarial Work
- ☐ Spanish
- ☐ French
- ☐ Salesmanship
- ☐ Advertising
- ☐ Service Station Salesmanship
- ☐ First Year College Subjects
- ☐ Business Correspondence
- ☐ Stenography and Typing
- ☐ Civil Service ☐ Mail Carrier
- ☐ Railway Mail Clerk
- ☐ Grade School Subjects
- ☐ High School Subjects
- ☐ College Preparatory
- ☐ Illustrating
- ☐ Cartooning
- ☐ Lettering Show Cards ☐ Signs

DOMESTIC SCIENCE COURSES

- ☐ Home Dressmaking
- ☐ Professional Dressmaking and Designing
- ☐ Advanced Dressmaking
- ☐ Millinery
- ☐ Tea Room and Cafeteria Management, Catering
- ☐ Foods and Cookery

Name.....*Age*.....*Address*.....

City.....*State*.....*Present Position*.....

If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada

W. F. HALL PRINTING CO.

PRODUCED BY UNZ.ORG
ELECTRONIC REPRODUCTION PROHIBITED

OUR SENSATIONAL NEW 1937 CATALOG NOW READY! NEARLY 600 PAGES OF UNUSUAL NOVELTIES. SEND 3c FOR IT!

BROADCAST thru your radio TALK - SING - PLAY

BROADCAST your voice on programs coming through your own radio set—make announcements from any part of the house—inject wise cracks, josh and mystify friends. Imitate radio stars, practice crooning, singing, radio acting, etc. Do a "Ben Bernie" or a "Rudy Valee."

World Mike

Made especially for home use, attached in a jiffy without tools. Not a toy. Put on your own programs at home, parties, club affairs, etc. Barrels of fun! Easy to operate.

Price Postpaid 25c

DELUXE MIKE

Large substantial, all-metal mike. Precise rating for broadcasting. Includes volume control, on-off switch, 5 ft. cord. Clear, loud, clear tone without distortion. Perfect for table model—can be held in hand. Guaranteed. Connected with 75c set tools. Postpaid

MIDGET POCKET RADIO $1.00

Listen to Music Programs and Sports Everywhere You Go—Loud Tone

Beautiful clear tone while you walk! The amazing midget pocket radio gives you all the entertainment of a radio wherever you go—in the country, office or automobile. Earphone, inlaid on bird's eye. **ANYWHERE** and **EVERYWHERE.** Size of a cigarette case. Weighs 3 oz. Yet it operates perfectly. Beautiful clear tone. Range 50 miles. No batteries, no tubes, no crystals to adjust. Just one nominal size penlight battery. Has sensitive rectifier and high efficiency coil. Radio Set $1.79. Not a toy. Price Postpaid $1.00. Extra Phone & Radio Set $1.79.

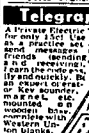
Wireless Transmitter Broadcasting Set $1

First again! First with the low-priced crystal radio, then the famous World Mike. Then the All Wave World Wide Radios, then the Dollar Pocket Radio, and **NOW** a genuine RADIO TRANSMITTER that sends out messages by wireless, for only $1.00, plus 10c postage. Note these sensational Features

★ **Can be picked up on a suitable Radio Receiver**
★ **Not a Mike, but a complete Broadcasting Set**
★ **Complete with Key, in Kit Form**
★ **Plugs in to any AC-DC circuit**
★ **Uses 2 oscillating tubes**

Complete Transmitter, $1.00 plus 10c post. Tubes (uses 2) Each 80c

Telegraph Set



A Private Electric Telegraph set for only 15c! Use it as a practice set or send messages to friends (sending and receiving). Learn the dots and dashes, fully and quickly. Contains a master buzzer, mounted on wooden base, complete with Western Union blanks, code and instructions; will work on battery as set for

15c

Book on Electricity

Only 15c for 64 page book containing everything especially for boys. Tells how to make electric motors, dynamos, motors, radio receivers, transmitting apparatus, coils, etc. Price 10c.

ALL WAVE WORLD WIDE RADIOS

Remarkable results—simple operation. Tunes from 15 to 2,000 meters. Gets police calls, foreign stations anywhere in the world, amateurs, ship and domestic broadcasts, etc. Range 3,000 miles with perfect efficiency. Each set complete without tubes. Set No. 1 (Crystal) Set.

ONE TUBE BATTERY SET. $1.55
Wiring ready to operate, $2.30.
Tube (uses 1) Each 80c
Gives better volume & sensitivity, Ready to operate, $2.75
ELECTRIC TWO TUBE SET. Complete with tubes. Powerful sensitive Kit, $3.00
Wiring ready to operate, $3.75

SWIM IN ONE TRIAL! WATER WINGS

Water Wings impart such confidence in water that even a child can't sink. Float at ease. Expert swimmers use them to cover long distances in deep water. Supports person up to 180 lbs. Can be carried in the hand blown up at seashore. Price **25c**

CRYSTAL RADIO 25c

This is a radio set as it should be, good reception at its best. Tunes within 25 miles of a station for up to 100 miles under good conditions. All you need besides this set is an aerial & ground. Completely assembled & wired with supersensitive detector, efficient variometer arm with cat's whisker, etc. Receives surprising distances. **25c**

YACHT CAP

Smart, sturdy cap that every real boy is wearing. Cool and comfortable. White Twill Yacht Cap with black silkcloth peak, sweat band, gold braid and brass buttons

25c

White Duck Yacht Cap, superior quality duck, reinforced cap, gold cord, brass buttons and red, white and blue anchor on front. Right size. Price postpaid

35c

WIND LIGHTER

LIGHTS IN ANY WEATHER

Famous Wind Lighter now better offering. Strong enough to light before. Brass in bright nickel finish. Can be refilled over and over again. Has patented windproof arrangement that can be adjusted almost any weather. Wicks are long lasting, are so reliable and so all-round useful that they are sold with a guarantee and so it may be attached to watch chain. Complete with lighter **25c**
Extra Flints, 3 for 10c.

CHAMELEON 25c

ALIVE PET

WATCH IT CHANGE COLOR!

Get one of these most wonderful of all creatures. Watch it change color. Study its habits. Wear one on the lapel of your coat as a curiosity. Shows color to suit your clothing. Lives on food. No trouble to keep. Can go for months without food or drink. Ships safely by mail to any address in USA or Mexico. We guarantee safe arrival in good condition. Price **25c**

Hill Billy Band

5 PIECES

Consists of 1 Harmonica, 1 Warbler, 1 Flute, 1 Kazoo, 1 Snare Drum. All the tools necessary to be a HILL BILLY. Whether you're going to town or to your own Hill Billy Band Set

15c

SILENT DEFENDER

Used by police officers, detectives, sheriffs and night watchmen as a protection against thugs, burglars, etc. Fatally fits the hand. Useful as an effective, Aluminum. Safety lever sets

SILENT DEFENDER. Price **25c**

CRYSTAL GAZING BALLS

A Look Into The Future

Guaranteed perfect in shape. A crystal ball of this kind is what you should be used, but the larger crystals are cheaper, and the vision is seen, consequently let's have the larger crystals. Ball is 2½ inches in size and is constantly and perfectly illuminated. Stand and base are highly polished. Set in

2 Inch Crystal	$2.50
3 Inch Crystal	$3.50
4 Inch Crystal	$4.50
5 Inch Crystal	$5.50
6 Inch Crystal	$6.50
Crystal Stand	.75c

Win Prize Contests

HOW TO WIN PRIZE CONTESTS

Tells the best methods and principles for winning some of the big prizes offered in the various contests announced. People make tidy sums of money by entering the various contests. Methods and principles presented here have been gathered from interviews with the winners of some of the largest and best contests. Contains 64 pages. Size 5½ x 7½ inches. 600 ways to win. Postpaid

NOVELTY ASH TRAYS

Popular Designs

Three sensational brilliantly glazed, imported china ash trays. Each ends in a different color. Outmoded Novelty set. Assorted colors. Set of 3 for 25c. Set of 12 for 75c. Postpaid only.

FORTUNE TELLING CARDS

Tomorrow?

What will it bring for you? What will happen next month? Madam Zingara predicts the future. Using Gipsy Zingara predicts the deck and inserts for miles around will want to get in on the fun. Lots of entertainment evenings, etc. everyone will want you to tell their fortunes. Easy to learn. Yet there is nothing difficult to telling the fortunes every card. Printed on each card's meaning and the connection between the cards becoming apparent. Complete directions with each deck. Price 35c per deck. Deluxe deck with 53 fancy finished cards 75c, postpaid.

CIGARETTE MAKER

Roll your own and save money. Better and quicker than ready made. Simple to operate. Neat, useful, handy. Pays for itself in a few days. Ounce Nickel plated

25c

BIG ENTERTAINER

326 Jokes & Riddles, 25 Tricks, 10 Parlor Games, 23 Tonics, 103 Money-making Secrets, 52 Monologues, 21 Puzzles, 10 Problems, Comic recitations, Funny Readings, 19 Parlor Pastimes, 5 Comic Games, Names & their Meanings, 10 Picture Puzzles, 12 Comic Songs, Dead and Dumb Alphabets, Shadowgraphy, Fortune Telling, Formula, Wit, Humor, Facts, Curious, etc. Hypnotism, Ventriloquism, Cut-outs for Children, Chess, Dominoes, Checkers, Hidden Words, Anagrams, 25 card Tricks, Serious Questions, etc. Postpaid

15c

LUMINOUS PAINT

LUMINOUS PAINT, when applied to an object in the dark, makes it visible. Makes it visible in the dark. The darker the room the more visible it is. Paint it on anything you can do it! Apply some to the face of your alarm clock and tell the time at night. Paint mushbuttons, switches and locks on doors, etc., so that you can find them in the dark. Paint shoes, etc. Medium size 50c. Large size $1.00 postpaid.

JOY BUZZER 28c

Funniest novelty ever invented! Fits the finger like a ring but contains a tiny electric shocker. The Buzzer, or tickler, contained in a flesh colored rubber ring fits around one finger. Whenever it is touched, the mechanism is released, giving the victim a shock. Every time you shake hands with someone you will get a violent shock. Touch them on the back, and watch them jump. Even will hit the ceiling if a mouse has been in the house. Put in tic-tac-toe window. Hundreds of uses. ONLY

28c

Resurrection Plant

Curious novelty. Place in water, plant grows. Takes weeks to grow in a few minutes. Even cut it into various pieces and they will grow into complete plants. Put in water to-day and in a few minutes a beautiful green plant will be growing. Postpaid. 10 cents. 3 for 25c.

Detective Make-Up Kit

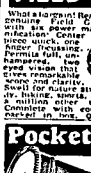
Contains everything needed to alter the face to represent any character, the beautiful heroine, the vicious Villain, the Charming Beau, the Comic Old Lady, the Dude, the Hobo, the Negro Minstrel and many others. Just a few touches and the expression is entirely changed so that even your most intimate friend will not know you. Amateur's Make-Up Kit. Price

50c

Sex Indicator

Fascinating discovery that is used by some to tell the sex of eggs, hatching eggs, etc., by

FIELD GLASSES 25c



What a bargain! Real compact Field Glasses with genuine Leather case. Fine lenses, precision made, compact. Ideal for hunting, sports, etc. Permits full, unhampered, two-eyed vision that greatly increases enjoyment and clearness. Powerful for distance. Only, postpaid

25c

Pocket Telescope

Eagle-Eye Vision
Six Power
25c

Big, 3 draw, 6 power, genuine leather covered. Only 25c! Swell for camping, study, sports looking at the moon. Can be used for distance by using smoked glass so you can see sun spots. Postpaid

IRWIN PROJECTOR

A real Electric Movie Machine for only 35c! Shows bright, clear pictures 9½ feet wide by 7½ inches in size. Just insert the film, turn the crank and watch the pictures dance on the silver! Uses 2 flashlight cells obtainable anywhere. Bright red reflector. Lens is 1½ inches, aiming 5x2x3 inches. Complete with bulb, ready to use. Also uses 6 volt bulb. Your choice of Felix the Cat, Wild West, Mutt & Jeff, Movie Kit, etc. Postpaid

35c

FUN LICENSES 10c

Large size, nicely printed with real-looking seal. Fun-provoking! Stand one of these to your friends. Will witness or attest you! Birth Certificate Death Certificate Wedding Certificate Arrest Certificate Divorce Certificate College Diploma Etc.

Marriage Certificate Liar & Grafter Cer. Engineers Certificate Spanish Athletes Cer. Boxing Certificate Price 10c each license. Any 3 for 25c.

CIGAR LIGHTERS

Four unique lighters at the low price of 15c each. Pull cigarette lighter; key lighter; Bullet and one when looked like a cigarette—will fit into your cigarette case. Each lighter very long. Choice of

15c
4 Flints 3—10c

Open Any Lock

Did you ever lose or forget your key? Probably many times. Don't worry any more about that key. Buy one key (or that matter), as these master keys will open most ordinary door locks. Has different keys for various types of locks. Will open padlocks, too. Easy to use them once, but you'll usually find them so handy that you'll use them often.

4 MASTER KEYS Price 25c

Good Luck Ring

Very stunning, quaint and uncommon. Oxidized gunmetal finish, with odd rosebush design; two imitation rubies or emeralds (your choice). Sold to bring good luck. Wear one. Only

Pistol Cigarette Case 25c

Hands Up!

It looks like a deadly weapon, but it's really a novel Cigarette Case. Better than the real thing. Shoots cigarettes right at your counter. Great fun "sticking up" your friends. Has a spring action under the trigger and the slide flies up. Price

25c

Sensational Photo Rings

Your friend's picture slips neatly into this ring. Genuine photo fine that is surprisingly clear. Set in beautiful, classical ring mounting. Choice of Silver finish or 24 kt. gilt finish mounting.

35c

Photo Tie Holder, Silver Finish Price **35c**
Photo Pendant Fob, Silver Finish Price **35c**
Chain Photo Identification Bracelet, Silver Finish Price **50c**
Postpaid. Price

WHOOPEE CUSHION

Whoopee Cushion is made of rubber in the latest like a balloon, and when placed on chair, couch, seat, etc., and unsuspecting sits upon the cushion, it gives forth noises against the pants. Postpaid. Price

25c

BOYS! BOYS! BOYS!

THROW YOUR VOICE!

into a trunk, under the bed or anywhere. Lots of fun fooling teacher, policeman or friends.

THE WONDERFUL VENTRILO

A little instrument, fits in the mouth out of sight, used with it for Bird Calls, etc. Anyone can use it. Never fails. A complete book with 9 page full course on Ventriloquism together with the Ventrilo. Sent postpaid for only.....

10c

WONDERFUL X-RAY 10c

GREAT CURIOSITY! With it you can apparently see through clothing, flesh and bone! Pencil even the flesh seems transparent. Always ready for use. Only 10 c and post.

Rolmonica Automatic Mouth Organ $1.10

An automatic mouth organ that plays itself. Just put mouth piece to player nr. Blow or draw breath and all tunes and the 10 biggest songs are played.

ELECTRITE PENCIL

Writes in Gold on Any Article

Practically writes in gold, silver, red, yellow, purple, green or blue. Writes on any surface, like satin, celluloid, silk, rubber, leather, wood, paper, stone, metal, glass or initials in gold or any color on your finger nails. Has self-contained mounting reservoir and writes for months without refilling. Electrite pencil, complete with

$1.25

Adding Machine

Adds, subtracts, multiplies, divides. Does work of a many thousand dollar machine. Simple and accurate. NOT a toy. Easy to operate. Just turn a knob to punch, no lever to pull. Total is shown in large figures. Lasts years. Lightning calculator. Just the thing for everyday use. Guaranteed accurate. Guaranteed for life. Has visible total. Adds up to 9,999,999,999. Will not get out of order. Will add eight in what looks like one stroke. Will add a column of figures as fast as you can write them. Will add a column of 100 figures in 10 seconds. Will add a column of 1000 figures in 1 minute. Will add a column of 10,000 figures in 10 minutes. Will add a column of 100,000 figures in 1 hour. Will add a column of 1,000,000 figures in 10 hours. Will add a column of 10,000,000 figures in 100 hours. Will add a column of 100,000,000 figures in 1000 hours. Will add a column of 1,000,000,000 figures in 10,000 hours. Will add a column of 10,000,000,000 figures in 100,000 hours. 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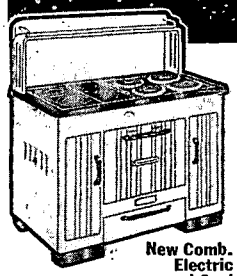
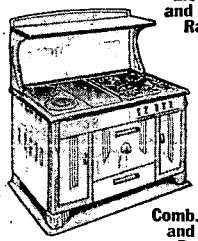
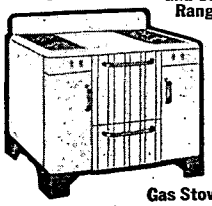
THEY SAID A STOVE LIKE THIS WOULD COST A LOT--BUT IT DIDN'T. I GOT IT AT THE FACTORY PRICE!



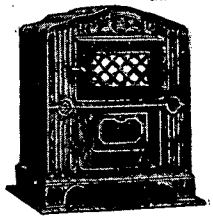
New Comb. Electric and Coal Range



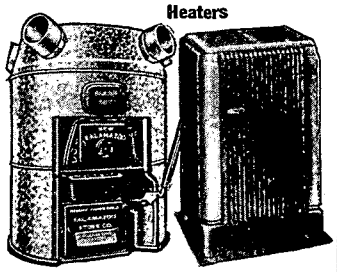
Comb. Gas and Coal Ranges



Gas Stoves



Heaters



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"—and I paid for it by the month"

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Nearly 200 Styles and Sizes

"Mail the coupon! You'll find nearly 200 styles and sizes of Heaters, Ranges and Furnaces—many illustrated in beautiful pastel colors—actually more bargains than in 20 big stores.

As Little as 12c a Day

"You'll be amazed to find how far your pennies stretch. Some stoves cost as little as 12c a day at the FACTORY PRICE—and 18 months to pay, if you wish.

Stoves Sent on Trial—1,200,000 Users

"You'll like the way Kalamazoo does business—the same 'Factory-to-You' way they have dealt with 1,200,000 satisfied users for 37 years. 30 days trial. No urging! Service is fast—24 hour shipments. Satisfaction or money back.

New Ranges—New Heaters

"In this Catalog you'll see new modern stoves of sparkling beauty—Porcelain Enamel Coal and Wood Ranges in white and delicate pastel colors—new Combination Gas, Coal and Wood Ranges—and something altogether new, *a Combination Electric and Coal Range*. Also new Gas Stoves—Oil Stoves—New Coal and Wood Circulating Heaters—Garage Heaters—Furnaces (free plans)—all at Kalamazoo FACTORY PRICES.

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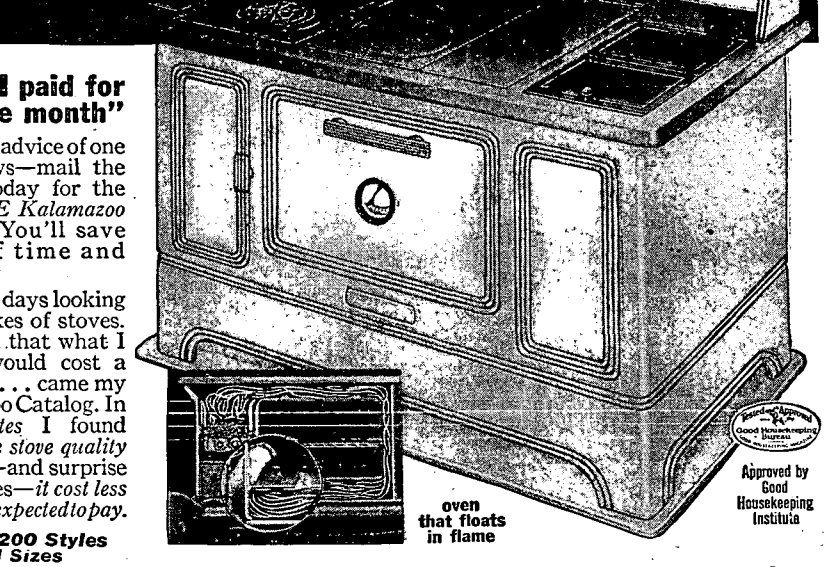
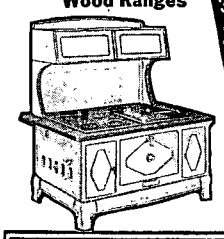
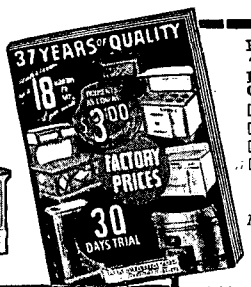


oven that floats in flame

Approved by Good Housekeeping Institute

Coal and Wood Ranges





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